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HOW OUR ANCESTORS IN THE STONE AGE MADE THEIR IMPLEMENTS.

BY B. B. REDDING.

FLINT, obsidian, chert and other hard stones having a conchoidal fracture, manufactured into forms to be used as axes, chisels, knives, scrapers, spear and arrowheads, are found in nearly all parts of the world. They are almost the only remains of a race of people who inhabited the earth at a period so remote that they were contemporaneous with the woolly elephant, the cave bear, the Irish elk and other animals now extinct. These implements are often found in connection with the remains of these and other fossil animals. In one instance in Denmark a stone arrowhead was found imbedded in the bone of a deer which has been so long extinct that the species is only now known from its fossil remains. The people who made these stone implements lived in Palestine, ages before Tubal Cain, and in Egypt long before the first Pharaoh; their flint knives, axes and arrowheads have been found in Europe from Greece to Norway, and from France to the steppes of Russia; in Asia from India and the Malay archipelago to Japan and Kamtchatka; in America from Greenland and Alaska south through the United States, the West Indies, the valley of the Amazon and Peru to Terra del Fuego. They seem to prove that man was originally a savage, that he lived by fishing and the chase, and that civilization has been a long, slow and tedious process of evolution.

There is great similarity in these stone weapons and implements wherever found throughout the world. A spearhead or scraper, an arrowhead or celt from England, could not by its shape or peculiarity of manufacture be distinguished from similar

implements found in Denmark, Palestine, Japan or South America. The stones used might differ, but the mode of manufacture and general shape are nearly always the same. How our prehistoric ancestors could have made these stone implements ages before the discovery of the use of bronze or iron, has been the subject of many speculations among archæologists, and many theories have been advanced in support of these speculations. The general conclusion has been that they were chipped into the shapes we find them by blows from small stone hammers. It is, however, proper to state that Mr. John Evans, Sir John Lubbock, Mr. A. Morlot and other writers on prehistoric remains, have suggested that the observations of travelers, as to the modes pursued by savage nations in similar work, might afford a correct solution.

The theory that they were manufactured into the shapes we find them by blows from stone hammers, was generally received until after the publication, in the *Overland Monthly*, of the observations of Mr. E. G. Waite and the late B. P. Avery, and in the Smithsonian reports of a letter of Gen. George Crook, all of whom had had an opportunity to observe Pacific Coast Indians manufacture stone implements and chip them into perfect shapes without the aid of stone hammers. As, however, these Indians used iron or steel in their work, obtained from white men, it was thought they might have changed the processes pursued by their ancestors. From a late newspaper paragraph I see that Mr. F. H. Cushing, who is connected with the Smithsonian Institution, by independent observation has arrived at the conclusion that the stone implements were not chipped into shapes by blows, but that the small flakes were broken out by pressure, and that to prove his theory he made a flint chisel, chipping it into shape by pressure with the aid only of a piece of hard wood.

Having had an opportunity to see a stone arrowhead made by a man, practically still living in the stone age, without the aid of any implement other than those found in a state of nature about him, and taking notes at the time of each act of manipulation and every process, I have thought that a record of what I saw, added to those made by other observers, might have some value in determining the processes used in similar work by our remote savage ancestors.

Prior to the close of the Modoc war, the Wintoons or Cloud

River Indians were without firearms. Up to that time the few settlers who reside about the base of Mount Shasta made it a rule to permit no Wintoon to carry a gun. As there are no agricultural lands and no mines on the Cloud river, the Wintoons were left in almost undisputed possession of their prolific hunting grounds and to the inexhaustible supplies of salmon and trout with which that river abounds. The Wintoons had but little contact with Americans until after Mr. Livingston Stone established a station on the river for the taking of salmon eggs for distribution by the U. S. Government. Very few of these Indians as yet have guns, their principal reliance in the chase being upon their primitive but powerful bow and arrows. The arrow maker is still a man of great importance in the tribe.

While visiting the United States Fishery a few days since I expressed a wish to Deputy U. S. Fish Commissioner Livingston Stone, who has acquired a knowledge of the Wintoon language, that one of the best arrowhead makers of the tribe should make, in my presence, a stone arrowhead, using only such tools and implements for the purpose as were in use by the Indians before their contact with white men. These people are only now emerging from the stone age, and a record of their manufacture of stone implements may give an illustration of the methods pursued by our ancestors in the palæolithic age, ten or twelve or more thousand of years ago, when they lived upon the products of the chase of the fossil deer, the aurochs and the cave bear.

Promptly at 3 o'clock came Consolulu, an old man between sixty-eight and seventy-two years of age, gray haired but erect and vigorous. He had been for many years chief of the tribe, and was elected chief when a young man, because alone and unaided he had killed a grizzly bear with his bow. He brought, tied up in a deer skin, a piece of obsidian weighing about a pound, a fragment of a deer horn split from a prong lengthwise, about four inches in length and half an inch in diameter, and ground off squarely at the ends—this left each end a semicircle, besides two deer prongs (*Cariacus columbianus*) with the points ground down into the shape of a square sharp-pointed file, one of these being much smaller than the other. He had also some pieces of iron wire tied to wooden handles and ground into the same shapes. These, he explained, he used in preference to the deer prongs, since white men came to the country, because they were

harder and did not require sharpening so frequently. When asked where he obtained the obsidian, he answered from a place on the north side of Mount Shasta, about sixty miles distant; that in former days the land where it is found was claimed by the Yreka Indians, and as this stone was wanted by the Trinity Indians, the Yrekas and the Modocs, as well as the Wintoons, it was rarely obtained without a battle. The piece he had was a light-blue in color, and he valued it at twenty dollars; he stated that if it were white it would be worth forty or fifty dollars. I could not learn that white obsidian is harder or is worked with greater ease; its increased value is probably based on its greater rarity. After stating that in battle he had been twice wounded with arrows, once in the shoulder and once through the calf of the right leg, and showing the scars above the ankle where the arrow had passed through, missing the bone, and been drawn out at the other side, and further stating, with evident gratification at the recollection, that while the arrow was still in his leg he sent one of his own into the throat of his opponent, from the wound of which he had bled to death in a few minutes, he commenced the operation of making a stone arrowhead. Holding the piece of obsidian in the hollow of the left hand, he placed between the first and second fingers of the same hand the split piece of deer horn first described, the straight edge of the split deer horn resting against about one-fourth of an inch of the edge of the obsidian—this being about the thickness of the flake he desired to split off; then with a small round water-worn stone which he had selected, weighing perhaps a pound, he with his right hand struck the other end of the split deer horn a sharp blow. The first attempt resulted in failure. A flake was split off but the blow also shattered the flake at the same time into small fragments. He then repeated the operation, apparently holding the split deer horn more carefully and firmly against the edge of the large piece of obsidian. The next blow was successful. A perfect flake was obtained showing the conchoidal fracture peculiar to obsidian. This I purchased, and instructed him to split off another from which to make the arrowhead. He repeated the operation and was again successful, and I have no doubt he could, with only an occasional failure, have split up the whole piece in a few minutes into shapes for spearheads, knives and scrapers. The shape naturally taken by the obsidian when split off in this manner is that

of a spearhead, and it could be put to use, for this purpose, with but slight alteration. The thickness of the flake to be split off depends upon the nearness or distance from the edge of the obsidian on which the straight edge of the split deer horn is held at the time the blow is struck.

The flake having been obtained, I watched with much interest and attention the process of working it into an arrowhead.

He now squatted on the ground, sitting on his left foot, his right leg extended in a position often assumed by tailors at work. He then placed in the palm of his left hand a piece of thick well-tanned buckskin, evidently made from the skin of the neck of a



FIG. 1.—Obsidian Flake.



FIG. 2 —Arrowhead of Obsidian.

deer. It was thick but soft and pliable. On this he laid the flake of obsidian, which he held firmly in its place by the first three fingers of the same hand. He then rested the elbow on the left knee, which gave the left arm and hand holding the flake, firm and steady support. He then took in his right hand the larger of the two deer prongs, which, as has been stated, had its point sharpened in the form of a square file, and holding it as an engraver of wood holds his cutting instrument, he commenced reducing one edge of the circular form of the flake to a straight line. With the thumb of the right hand resting on the edge of the left palm as a fulcrum, the point of the deer prong would be made to rest on about an eighth of an inch or less of the edge of

the flake, then with a firm downward pressure of the point, a conchoidal fragment would be broken out almost always of the size desired. The point of the deer prong would then be advanced a short distance and the same operation repeated, until in a few minutes the flake was reduced to a straight line on one edge. As this operation broke all the chips from the under side of the flake, if left in this condition the arrowhead would be unequally proportioned, that is, the two cutting edges would not be in the center. He therefore with the side of the deer horn firmly rubbed back and forth the straight edge he had made on the flake until the sharp edge had been broken and worn down. The flake was now turned end for end in the palm of his hand and the chipping renewed. When completed an equal amount was taken from each side of the edge of the flake and the cutting edge was left in the center. It was now plain that the straight edge thus made was to be one side of the long isosceles triangle, the form of the arrowheads which is used by his tribe.

With the flake of obsidian firmly held in the cushion of the left palm and the point of deer horn strongly pressed on the edge of the flake, the effect was the same as the blow which split the flake from the larger piece. While, however, he was not always sure of the effect of the blow in splitting off the large flakes out of which to make the arrowheads, he in no instance appeared to fail in breaking out with the point of deer-prong the exact piece desired. The soft thick pliable piece of tanned deer skin on which the flake in his left palm was held, may have added to the cushion, but seemed to serve no other purpose than to save his hand from being cut by the countless sharp chips as they were broken off. One of the long sides of the arrowhead having been thus formed, the flake was turned over and the other side formed in the same manner. As, however, very much more of the obsidian had to be chipped away, he brought more pressure upon the point and broke out larger chips until the flake began to assume the shape desired, when the same care was exercised as when the first straight edge was made. In breaking out large or small chips the process was always the same. The pressure of the point of deer horn on the upper edge of the flake never appeared to break out a piece, which, on the upper side, reached beyond where the point rested, while on the under side the chip broken out might leave a space of twice the distance. Invariably when a line of

these chips had been broken out the sharp edge was rubbed down, the flake turned end for end and the chipping renewed on the other side. By this process the cutting edges of the arrowhead were kept in the same line. The base was formed in the same manner. No lines were drawn but he would occasionally look at his work as it progressed and chip on one side or the other to keep their proportions equal. The base of the arrowhead—opposite the point—when finished, is inserted in a slot made in the end of the wooden shaft, and is firmly tied to it by the tendons of a deer. To hold the arrowhead firmly to the shaft and to prevent the thread of deer tendon from interfering with the penetrating power of the arrow, a slot about one-fourth of an inch deep is chipped into both cutting edges of the arrowhead about one-fourth of an inch above the base. This causes the arrowhead to look as if it were barbed, but the object seems only to be to provide means by which the arrowhead may be firmly fastened to the shaft, at the same time avoiding the making of any obstruction to the penetrating or cutting power of the arrowhead. The chipping out of these slots was the last operation to be performed. It seemed to me more difficult than any other part of the work, and I thought that in this would be the danger of the loss of all the patient labor that had been expended. In practical operation it was the simplest, safest and most rapid of all his work. He now held the point of the well-shaped arrowhead between the thumb and first finger of his left hand with the edge of the arrowhead upwards, the base resting edgewise on the deer-skin cushion in the palm. He then used the smaller deer prong, which had been sharpened in the same form as the larger one, but all its proportions, in every respect, were very much smaller; its point could not have been larger than one-sixteenth of an inch square. He rested this point on the edge of the arrowhead where he desired to make the slot, and commenced sawing back and forth with a rocking motion, the fine chips flew from each side, the point of the deer horn descended, and in less than a minute the slot was cut. The arrowhead was turned over and the same operation repeated on the other edge. It seemed that by this process, if he desired, the arrowhead could have been cut in two in a very few minutes. He now examined his work in the strong sunlight and, being satisfied, handed me the completed arrowhead. It had taken him forty minutes to split the two

flakes from the large piece of obsidian and chip one of them into the arrowhead. A younger man, equally expert, would probably have done the work in half an hour. When I came to the purchase of the arrowhead and flake, I found they would cost seventy-five cents, payable in shells, *Dentalium entalis*, which he esteemed more highly than their value in money. The worth of the flake and arrowhead was not based upon the time or labor employed, but upon the value of the obsidian, as he offered for a dollar's worth of shells to give me ten arrowheads of the same shape and size made from the bottoms of glass ale bottles.

The celts, knives, chisels and scrapers of the stone age are all much simpler and more easy of manufacture than these semi-barbed arrowheads.

I doubt if stone hammers were used in their manufacture other than to split off the flakes from a large piece of flint or obsidian, and when thus used the blow was communicated through the split deer horn or a piece of hard wood in the manner I have described. The blow from a stone hammer direct on the flint or obsidian would be very uncertain in its results even in the most skillful and practiced hands. With the split deer horn the thickness of the flake and probable length could be determined with tolerable accuracy. Probably large chips could be broken from the edge of a flake by a slot in the end of a deer horn as is now practiced by the natives of Alaska with a walrus tusk, used as I have seen window glass broken with a key, but an arrowhead is too small and delicate for either operation.

I cannot but believe that our prehistoric ancestors in the stone age used the same processes as were followed by Consolulu, and that in describing what he did I have told how the remote ancestor of

" The ancient arrow maker
Made his arrowheads of sandstone
Arrowheads of chalcedony
Arrowheads of flint and jasper
Smooth and sharpened at the edges
Hard and polished keen and costly."

COLORADO PLANTS.

BY ISAAC C. MARTINDALE.

REALIZING the fact that all discoveries or observations, unless brought to the attention of the people in some way, cannot be expected to be of much advantage to them, I have prepared this article in the belief that some lover of flowers, who has been or may be traveling over the same route taken by myself, may find in it a help or an assistance in the prosecution of the study of botany, or in naming the specimens collected by the way.

The list of plants hereto appended is of the specimens collected while on an excursion of the members of the American Association for the Advancement of Science after the adjournment of the St. Louis meeting in 1878, and during the time of the meeting at St. Louis on the excursions around the city, chiefly near Cahokia, Illinois. The route taken from St. Louis was westward to Kansas city, thence by the Kansas Pacific R. R. to Denver, thence southward to Colorado Springs, Manitou, Garden of the Gods, Queens Cañon, Glen Eyrie and Pike's Peak, making the ascent by way of Engelmann's Cañon; continuing the journey from Colorado Springs southward to Alamosa and returning to Denver; thence by way of Clear Creek Cañon to Idaho Springs, Georgetown, Central city and Blackhawk, also visiting Boulder Cañon as far as the Falls.

The rapidity of travel and consequent difficulty in taking proper care of the specimens prevented a larger collection being made, yet it is believed it embraces the greater part of the plants that may be found on the line of the route traveled. About forty persons participated in the excursion, several of whom were interested in the botany of the region and made collections of plants; I have been favored with an examination of these, and think the list includes all or nearly all that were obtained. Mr. Thomas Meehan, of Germantown, State Botanist of Pennsylvania, was one of the excursion party, and having visited Colorado on two former occasions, was well informed about the plants, and rendered valuable service. Prof. Gray and Sereno Watson, of Cambridge, Mass., Dr. Vasey, of Washington, and others assisted in the naming of some of the more difficult species.

In the closing number of Vol. III of *Field and Forest*, published at Washington, D. C., may be found an article, by Lester F.

Ward, on "St. Louis and Botany," to which the reader is referred for a more minute account of the botanical features noticed there; it embraces some species not included in this article, as they were collected before I reached St. Louis. During the fall and early winter a series of articles appeared in the *West Jersey Press*, of Camden, New Jersey, descriptive of the entire journey, and giving a detailed account of the places visited. Lester F. Ward, who accompanied the excursion to Texas after the adjournment of the Nashville meeting in 1877, published a list of the botanical collections made on that occasion in the *Bulletin of the Essex Institute*, and it seems to me that if the results of the collections made on these annual excursions could be brought in some way before the people, it would be of great service to students and others engaged in scientific work.

The species collected in Colorado and not mentioned in Porter and Coulter's Flora are printed in *italics*, those collected in the vicinity of St. Louis are marked *, those collected on the line of the railroad before reaching Colorado are marked †.

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|---|--|
| † <i>Clematis Pitcheri</i> T. & G. | † <i>Vitis indivisa</i> Willd. |
| " <i>ligusticifolia</i> Nutt. | <i>Ampelopsis quinquefolium</i> Mx. |
| <i>Thalictrum Fendleri</i> Eng. | <i>Acer glabrum</i> Torr. |
| <i>Anemone multifida</i> D. C. | <i>Rhus aromatica</i> Ait. var. <i>trilobata</i> Gr. |
| <i>Ranunculus affinis</i> R. Br. | * <i>Æsculus glabra</i> Willd. |
| " <i>adoneus</i> Gray. | * <i>Baptisia leucantha</i> T. & G. |
| <i>Delphinium scopulorum</i> Gr. | <i>Lupinus argenteus</i> Pursh, var. <i>decumbens</i> |
| <i>Argemone hispida</i> Gray. | Watson. |
| <i>Corydalis curvisiliqua</i> Eng. | <i>Trifolium involucreatum</i> Willd. |
| <i>Physaria didymocarpa</i> Gray. | <i>Psoralea tenuiflora</i> Pursh. |
| * <i>Sisymbrium incisum</i> Eng. | <i>Petalostemon violaceus</i> Mx. |
| <i>Erysimum asperum</i> D. C., var. <i>Arkan-</i> | " <i>candidus</i> Mx. |
| <i>sanum</i> Nutt. | <i>Astragalus mollissimus</i> Torr. (?) |
| <i>Lepidium intermedium</i> Gray. | <i>Sophora sericea</i> Pursh. |
| " <i>montanum</i> Nutt. | * <i>Desmodium canescens</i> D. C. |
| <i>Cleome integrifolia</i> T. & G. | * <i>Phaseolus pauciflorus</i> Benth. |
| <i>Polanisia trachysperma</i> T. & G. | † " <i>diversifolius</i> Persoon. |
| " <i>graveolens</i> Raf. | * <i>Cassia nictitans</i> Linn. |
| <i>Silene acaulis</i> Linn. | * " <i>chamaecrista</i> Linn. |
| " <i>Scouleri</i> Hook. | <i>Robinia Neo-Mexicana</i> Gray. |
| <i>Arenaria Fendleri</i> Gray. | <i>Prunus Virginiana</i> Linn. |
| <i>Talinum teretifolium</i> Pursh. | <i>Neillia Torreyi</i> Watson. |
| <i>Claytonia Chamissonis</i> E. & L. | <i>Spiraea discolor</i> Pursh, var. <i>dumosa</i> Wat- |
| <i>Sidalcea malvæflora</i> Gray. | son. |
| <i>Malvastrum coccineum</i> Gray. | <i>Rubus deliciosus</i> Torr. |
| <i>Geranium Fremontii</i> Torr. | " <i>strigosus</i> Mx. |

- Cercocarpus parvifolius* Nutt.
Geum Rossi Seringe.
Fragaria vesca Linn.
Potentilla glandulosa Lindl.
 " *rivalis*, Nutt.
 " *dissecta* Pursh.
 " *fruticosa* Linn.
 " *Anserina* Linn.
 **Rosa setigera* Mich.
 " *blanda*, Aiton, var. *setigera* Crépín.
Cratogeomys coccinea L. var.
Saxifraga bronchialis Linn.
 " *nivalis* Linn.
 " *Jamesii* Torrey.
 " *chrysantha* Gray.
Jamesia americana T. & G.
Sedum Rhodiola D. C.
 " *stenopetalum* Pursh.
Epilobium angustifolium Linn.
 " *paniculatum* Linn.
Gayophytum ramosissimum T. & G.
 †*Eriogonum coronopifolia* T. & G.
 †*Gaura parviflora* Dougl.
 † " *biennis* Linn.
 **Ludwigia polycarpa* S. & P.
 **Ammania latifolia* Linn.
Mentzelia nuda T. & G.
 " *multiflora* Nutt.
Echinocactus Simpsoni Eng.
Cereus viridiflorus Eng.
Opuntia Rafinesquii Eng.
 " *Missouriensis* D. C.
 " *arborescens* Eng.
Cucurbita perennis Gray.
 †*Echinocystis lobata* T. & G.
Cymopterus anisatus Gray.
Ligusticum scopulorum Gray.
Symphoricarpos montanus H. B. K.
 " *occidentalis* R. Br.
 * " *vulgaris* Mich.
Galium asperinum Gray.
 † " *trifidum* Linn.
 " *boreale* Linn.
 **Vernonia fasciculata* Mx.
Liatris punctata Hook.
Pectis angustifolia Torr.
Kuhnia eupatorioides L.
Brickellia Wrightii Gray.
 " *grandiflora* Nutt.
 **Eupatorium serotinum* Mx.
Torrensia eximia Gray.
 **Boltonia glastifolia* L'Her.
Aster laevis Linn.
 " *multiflorus* Aiton.
 " *falcatus* Lindl.
 " *canescens* Pursh.
 " *tanacetifolia* H. B. K.
 " *Pattersonii* Gray.
 " *glaucus* T. & G.
 " *carneus* Nees.
 †*Eriogonum divaricatum* Mx.
 " *grandiflorum* Hook.
 " *bellidiastrum* Nutt.
 " *macranthum* Nutt.
 " *divergens* T. & G.
 " *ursinum* Eaton.
Gutierrezia Euthamiae T. & G.
Solidago Virga-aurea L.
 " " var. *multiradiata* T.
 & G.
Solidago nemoralis Aiton, var. *mollis*
 Benth.
Solidago canadensis Linn.
Bigelovia graveolens Gray.
Aplopappus spinulosus D. C.
 " *pygmaeus* Gray.
 " *Parryi* Gray.
 † " *ciliatus*.
Grindelia squarrosa Dunal.
Chrysopsis villosa Nutt.
 " " var. *hispida*.
Pericome caudata Gray.
 **Iva ciliata* Willd.
 * " *xanthiifolia* Nutt.
 **Ambrosia psilostachya* D. C.
 * " *tridentata*.
 **Eclipta procumbens* Michx.
 †*Heliopsis laevis* Pursh., var. *scabra*.
Rudbeckia hirta Linn.
 †*Lepachys columnaris* T. & G.
Helianthus lenticularis Dougl.
 * " *rigidus* Desf.
 " *pumilis* Nutt.
 " *Maximilliana* Schrad.
Heliomeris multiflora Nutt.
 **Coreopsis aristosa* Mx., var. *mutica*.
Ximenesia encelioides Cav.
Dysodia chrysanthemoides Lag.
Gaillardia aristata Pursh.
Actinella grandiflora T. & G.

- Artemisia borealis Pall.
 " Canadensis Mx.
 " filifolia, Torr.
 " tridentata Pursh.
 " Ludoviciana Nutt.
 " " var. gnaphalodes T. & G.
 " frigida Willd.
 " scopulorum Gr.
 " " var. monocephala.
 " arctica Less.
 *Gnaphalium uliginosum Linn.
 Antennaria dioica Gau.
 Arnica alpina.
 " mollis Hook.
 Senecio eremophilus Rich.
 " Bigelovii Gray.
 " Fendlerii.
 " spartioides.
 " rapiifolius Nutt.
 *Cacalia atriplicifolia Linn.
 Cnicus eriocephalus Gray.
 " edulis Nutt. (?)
 Troximom glaucum.
 *Lactuca scariola Linn.
 † " elongata Muhl.
 Lygodesmia juncea Don.
 Campanula uniflora Linn.
 " Scheuchzeri Vill.
 " rotundifolia Linn.
 Arctostaphylos Uva-ursi Spreng.
 Pyrola secunda Linn.
 Androsace chamæjasme Host.
 " septentrionalis Linn.
 Asclepias Jamesii Torrey.
 * " verticillata Linn.
 *Acerates longifolia Ell.
 *Enslenia albida Nutt.
 Gentiana Amarella Linn.
 " " var. stricta Watson.
 " frigida Hænke.
 " Parryi Engel.
 " affinis Griseb.
 Frasera speciosa Dougl.
 Collomia linearis Nutt.
 " longiflora Gray.
 Gilia aggregata Spreng.
 " pinnatifida Nutt.
 Phacelia circinata Jacq. f.
 " glandulosa Nutt.
 Nama dichotomum R. & P., var. angustifolium Gray.
 Echinosperrum Virginicum Lehm.
 † " Redowskii Lehm. var. occidentale Watson.
 Eritrichium crassiseptalum T. & G.
 " Jamesii Torr.
 " glomeratum D. C., var. virgatum Porter.
 Mertensia alpina Don.
 *Onosmodium carolinianum D. C.
 Ipomea leptophylla Torr.
 Evolvulus argenteus Pursh.
 Cuscuta decora Choix.
 Solanum triflorum Nutt.
 * " Carolinense Linn.
 " rostratum Dunal.
 † " nigrum Linn.
 Physalis hederæfolia Gray. (?)
 † " lanceolata Michx.
 " lobata Torr.
 Pentstemon secundiflorus Benth.
 " glaucus, Graham, var. stenosepalus Gray.
 Chionophila Jamesii Benth.
 Mimulus floribundus Dougl.
 *Conobea multifida Benth.
 *Herpestis rotundifolia Pursh.
 *Synthesis Houghtoniana Benth.
 Veronica peregrina Linn.
 *Gerardia purpurea Linn.
 Castilleja linariæfolia Benth.
 " miniata Dougl.
 " pallida Kunth.
 " breviflora Gray.
 Orthocarpus luteus Nutt.
 Pedicularis Parryi Gray.
 " procera Gray.
 *Ruellia ciliosa Pursh.
 † " strepens Linn.
 *Verbena stricta Vent.
 " bracteosa Michx.
 " Aubletia Linn.
 *Teucrium canadense Linn.
 *Mentha sativa Linn.
 Hedeoma Drummondii Benth.
 † Salvia azurea Lam., var. grandiflora Benth.
 † " lanceolata Willd.
 Monarda fistulosa Linn.
 † Blephilia hirsuta Benth.
 † Lophanthus nepetoides Benth.
 Dracocephalum parviflorum Nutt.
 Plantago patagonica Jacq., var. gnaphalioides Gray.

- Plantago patagonica* var. *aristata* Gray. *Pinus contorta* Dougl.
Mirabilis multiflora Gray. " *ponderosa* Dougl.
" *oxybaphoides*. " *flexilis* James.
**Oxybaphus nyctagineus* Sweet. " *aristata* Engelm.
" *angustifolius* Sweet. *Abies Engelmanni* Parry.
Abronia fragrans Nutt. " *Douglassii* Lindl.
Chenopodium Fremontii Watson. " *concolor* Lindl.
Blitum capitatum Linn. *Juniperus virginiana* L.
Obione argentea Moq. " *occidentalis* Hook.
Eurotia lanata Moq. *Typha latifolia* Linn.
†*Alternanthera lanuginosa* Torr. *Iris Missouriensis*.
Paronychia Jamesii T. & G. *Sisyrinchium Bermudiana* L.
Eriogonum alatum Torr. *Smilax herbacea* Linn.
" *Jamesii* Benth. *Streptopus amplexifolius* D. C.
" *umbellatum* Torr. *Calochortus Gunnisonii* Watson.
" *microthecum* Nutt., var. *effusum* T. & G. *Allium cernuum* Roth.
" *annuum* Nutt. " *reticulatum* Fraser.
Oxyria digyna Camp. *Yucca angustifolia* Pursh.
Rumex salicifolius Weinm. *Juncus Balticus* Deth., var. *montanus* Eng.
Polygonum ramosissimum Mx. *Tradescantia Virginica* Linn.
" *tenuis* Mx. †*Cyperus Schweinitzii* Torr.
" *Pennsylvanica* Linn. *Carex atrata* Linn.
" *Bistorta* Linn. *Lycurus phleoides* H. B.
† " *Persicaria* Linn. *Sporobolus cryptandrus* Gray.
† " *Hydropiper* Linn. *Vilfa tricholepis* Torr.
† " *acre* H. B. K. *Muhlenbergia gracilis* Trin.
Arceuthobium americanum Nutt. " *glomerata* Trin.
†*Euphorbia hexagona* Nutt. " *gracillima* Torr.
" *marginata*, Pursh. *Calamagrostis sylvatica* D. C.
" *montana* Engelm. *Stipa viridula* Trin.
† " *heterophylla* var. *graminifolia*. *Bouteloua oligostachya* Torr.
* " *dentata* Mx. " *hirsuta* Lag.
* " *humistrata* Englm. " *curtipendula* Gray.
†*Croton Texensis* Müller. *Munroa squarrosa* Torr.
* " *capitatum* Michx. **Tricuspis purpurea* Nutt.
Urtica gracilis Aiton. *Poa tenuifolia* Nutt.
Parietaria Pennsylvanica Muhl. " *andina* Nutt.
Humulus Lupulus Linn. **Eragrostis reptans* Nees.
Quercus undulata Torrey, var. *Gunnisonii*. *Festuca ovina* L., var. *brevifolia* Watson.
Betula occidentalis Hook. *Bromus Kalmii* Gray.
†*Celtis occidentalis* Linn. *Lepturus paniculatus* Nutt.
Salix longifolia Muhl., var. *argyrophylla* Nutt. *Elymus Canadensis* Linn.
" *cordata* Muhl. " *Sitanion* Schult.
" *desertorum* Rich. *Cenchrus tribuloides* Linn.
" *flavescens* Nutt. (?) *Andropogon furcatus* Muhl.
Populus tremuloides Mx. *Cheilanthes lanuginosa* Nutt.
" *angustifolia* James. *Woodsia scopulina* Eaton.
" *monilifera* Aiton. *Notholena Fendleri* Kunze.
Selaginella rupestris Spring., var. *tropica*.

The following notes refer mostly to the species not mentioned in Porter and Coulter's Flora:

Argemone hispida Gray, is quite frequent along the base of the foot-hills below Denver with *A. mexicana*, but the stem is more hispid.

Polanisia graveolens Raf., by the roadside at the entrance to Boulder Cañon.

Ampelopsis quinquefolia Mx., collected in Queens Cañon, differs from the eastern form in the flowers being more persistent, the petals strongly reflexed, the leaves with larger and more acuminate teeth, and with remarkably falcate tips; the pedicels are more slender and drooping in fruit.

Psoralea tenuiflora Pursh, on the plains, not common.

Robinia Neo-Mexicana Gray, several clumps of trees on the side of the railroad in Southern Colorado.

Crataegus coccinea L., var. by the roadside at the entrance to Boulder Cañon: very conspicuous on account of the profusion of red fruit, the leaves are larger, the thorns stronger and often with rudimentary ones from their side.

Saxifraga chrysantha Gray. Pike's Peak, very scarce.

Townsendia eximia Gray. Veta Pass, Southern Colorado, not common.

Aster Pattersonii Gray. By the side of the railroad near Forks' Creek station.

Erigeron ursinum Eaton. Near Georgetown.

Pericome caudata Gray. Dr. Gray in examining this plant detected one or two delicate awns, the presence of which is likely to affect the genus; he says: "*Pericome caudata* has sometimes in its fullest development one or two slender, sparsely hirsute, rather deciduous awns surmounting the margins of the akene." Hence this plant collected in Queens Cañon becomes variety, or rather forma, *aristata*.

Helianthus Maximiliana Schrad. This plant is moving westward along the sides of the railroad.

Artemisia arctica Less. Pike's Peak.

Arnica alpina. Collected by T. Meehan near Pueblo.

Senecio Fendleri. Pike's Peak trail.

Senecio spartioides. Near Manitou Springs.

Senecio rapiifolius Nutt. Clear Creek Cañon and Garden of the Gods.

Cnicus edulus Nutt. (?). A single plant collected near Veta Pass; whilst agreeing tolerably well with the description of this species, the specimen is not in a condition to be satisfactorily determined. T. Meehan, who collected it, says he has not seen this plant from Colorado before.

Troximon glaucum. On the roadside between Bellevue mountain and Central City; quite scarce.

Phacelia glandulosa Nutt. Southern Colorado.

Physalis hederæfolia Gray (?). On the plains before reaching Denver; plant prostrate and very viscid, leaves small and short petioled.

Mimulus floribundus Dougl. The specimens collected at Boulder Falls have all the pedicels shorter than the leaves.

Herpestis rotundifolia Pursh. Collected at Cahokia, Illinois; with the leaves having punctate dots.

Salix flavescens Nutt. (?) On the trail to Pike's Peak through Engelmann's Cañon. M. S. Bebb says: "It has been frequently collected and is most likely allied to *S. flavescens* Nutt. of the Pacific coast, somewhat as *S. Fendleriana* is allied to *S. lasiandra*, that is, it may prove a hybrid between that and *S. discolor*."

Populus monilifera Aiton. On the low lands near Pueblo.

Abies concolor Lindley and *Juniperus occidentalis* Hook. In Engelmann's Cañon and Queens Cañon.

Smilax herbacea Linn. Plant more robust than the eastern form, leaves larger, more rounded; one specimen, only, collected in Glen Eyrie, with no evidence of the odor that usually accompanies the plant.

Lycurus phleoides H. & B. Collected in the Garden of the Gods, probably introduced from Mexico by traveling teamsters.

Muhlenbergia glomerata Trin. A form of this species near Manitou, not common.

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MOLD AS AN INSECT DESTROYER.

BY C. G. SIEWERS.

THE perplexing problem: How shall we check the excessive increase of noxious insects that imperil our crops? has been put in a fair way of solution by the researches of Dr. Bain, a Prussian savant, as recorded by Dr. Hagen, of Cambridge, Mass., in the June number of the *Canadian Entomologist*.

When Pasteur, employed by the French government to investigate the fatal malady that had attacked the silk-worm, made the discovery that the disease was caused by a fungus growth which he styled muscardine, that it could be imparted to healthy larvae simply by crushing infected ones on their food, and that the disease could be detected, by means of a lens, in the egg itself, and thus the good eggs separated from the bad, he saved from utter ruin thousands of French families whose main support depended on this industry. But he did more. Though he carried his researches no farther, others took up the investigation where he abandoned it, and the result of Dr. Bain's experiments, continued for twelve years, seem to have established the following facts:

That the mold of the mash tub, known as yeast, the mold that infects flies and fastens them to our walls and windows, the common mold of cellars and damp places, and the mold that attacks certain water plants are but different developments of allied species of fungi, and alike fatal to certain species of insects that are brought into contact with it; and that the disease was developed in France by moist food, lack of ventilation and cleanliness, is probable, and though many were able to pass through all stages, their infected eggs spread the disease through the land, and in this way became epidemic.

I have just had an unpleasant experience of the effect of mold in the loss of a full-grown imperial walnut larva that I had reared from its first molt. Its food was inserted in wet sand in a covered tub, and before I was aware, its droppings and food were covered with mold. Fresh food, a sun bath and change of quarters was of no avail; it refused food for four days, then dropped from its perch a moist discolored mass. In an article in the *Canadian Entomologist* (1877), I gave an account of a large colony of *Callimorpha* larvæ, a species by no means common generally, and of my failure to bring one larva in two hundred to the pupa state. They were all taken at maturity, like the French silk-worms, with a purging of whitish serum. The weeds on which they fed in the woods were also covered with their dried skins. The next year they were as rare as ever. In the spring of 1874, the shade trees of our town, Newport, Ky., were attacked by legions of small gray caterpillars, spinning up and destroying the foliage, and invading doorways in such multitudes that the house broom was in constant requisition. Fine shade trees were hewn

down, or fearfully lopped of their branches to abate the nuisance. They attacked the silver poplar in preference to all others, a tree singularly free from caterpillars heretofore. I found a small tree in my yard badly infested, and promised two small boys one cent a nest for all they got down with not less than twenty-five in a brood, and burning them as they were brought me, paid them ninety-seven cents for their hour's work. What was to be expected the next year but the total ruin of every shade tree; but my payment to the same boys was but forty cents, and the next year not one was to be found, and they have never returned to vex us. Continuous wet and cloudy weather may be sufficient to infect with fungus the food these caterpillars eat, but wherever we turn our eyes we find the provisions of nature ample to repress surplus life on this globe, and in no case more so than in our own species, where the half that survive infancy are winnowed out by sword, pestilence and famine, till but a corporal's guard can be rallied at our allotted term of three score years and ten. The cases I have described are by internal poisoning; I will add one where the poison fungus acted externally. My first attempt to carry through the winter that hybernating larva, the black bear (*Expanterea*), proved a total failure, as I put them away in the cellar where they were attacked and covered with mold, and though I washed and brushed them apparently clean, dried them in the sun and kept them out of doors the rest of the winter, they all died in the spring, refusing all food. Put away the next winter in leaves and brush, in the open air, I lost but one in ten. Exposed all winter to snow, frost and rain, under chips and wet leaves, coming out in the spring to feed, distended with moisture, they are perfectly healthy, for no fungus spores have been able to fasten upon them. That prolific oak larva, *Anisota senatoria*, is also a badly infected species, which makes it rather lucky for oak trees, for but few of them ever come to maturity. Experiments with diluted yeast should be tried on the potato bug, tobacco, army and cotton worm, and on the grasshoppers of old pastures and clover fields. The proper policy is not to kill, but simply to infect them that they may disseminate the poison. But while we fill the air with fungus spores let us have a care to discriminate between the just and the unjust; in slaughtering the Colorado bug and grasshopper, let us not also lay violent hands on our honey bee, on our harmless and beautiful butterflies, and on the various insects that sport in the sun and enliven the face of nature. The bugs and the worms that annoy us can easily be kept in check as I have shown, by paid handpickers.

NOTES ON PACIFIC COAST FISHES AND FISHERIES.

BY W. N. LOCKINGTON.

IN the market of San Francisco there was recently a specimen of *Poronotus simillimus* (the pompino of this coast) that had two mouths, one below the other, both furnished with teeth, and in size and external appearance the exact counterparts of each other. The lower mouth was situated somewhat behind the upper or normal mouth, directly beneath the eye and in front of the interoperculum. I much regret that I was unable to obtain possession of the fish, which is now, I believe, preserved in alcohol by the watchman of the market. I cannot, therefore, say anything about the bony structure of the extra mouth, or about the peculiarities of the digestive canal.

Anarrhichthys felis Grd., has, during the summer months, been frequently brought to the market of San Francisco, where it is sold as "eel," a name which is here applied to all the Blennioid fishes, as well as to *Leurynnis paucidens* and *Ophidium taylori*. Some of the dealers and fishermen, however, have given it the more appropriate name of "wolf-eel." The individuals brought to market are usually from four to five feet in length, but the species attains much larger dimensions. A specimen sent to the California Academy of Sciences, by Capt. Lawson, of the Coast Survey, and unfortunately lost through the lack of means to preserve it, measured eight feet in length; and one seven feet in length was noticed in the daily papers about three years since as an "infant sea-serpent." One large individual that lay upon the stall recently, showed the effects of a battle in the want of all that portion of the body situated posterior to the anus. The stomach of a very stout-looking example, five feet long, was opened, and was found to be filled with the tests of *Echinarachnius excentricus*, the common cake-urchin of the coast, broken into large fragments, many of them considerably more than an inch across; this Echinoderm is extremely abundant on the bar of San Francisco harbor at a depth of about seven fathoms, and the denuded tests are among the common objects of the seashore at the Cliff House.

The shark described by Ayres under the name of *Notorhynchus maculatus*, included by Günther under *Notidanus indicus*, and called by Gill (Proc. Acad. Nat. Sciences, Phila., 1864, 150) *Notorhynchus borealis*, attains considerable dimensions. An indi-

vidual taken at Long wharf, inside the harbor of San Francisco, about five years since, measures seven feet nine inches in total length.

The chimæra, *Hydrolagus colliciei*, is tolerably common on the more northern parts of the Pacific coast of North America. Mr. Ivan Petroff, editor of the *Alaska Appeal*, asserts that a Chimæra which he saw and of which he made a rough sketch (which he showed me), was without the long caudal filament of *H. colliciei*, and had a simple forked tail. Is it possible that there are two species of Chimæra in the North Pacific? The specimen just mentioned was taken while fishing for halibut and cod, and its stomach was filled with broken shells. I do not believe that anything is on record which tends to prove the use, in the economy of the Chimæra, of the curious projection upon the nose, armed at the end with a close-set array of hooked teeth set upon a terminal button of cartilage. The action of the individual in question, which saluted the cabin-boy who hauled it up by taking a piece out of his finger with this appendage, tends to prove that it is a weapon of offence.

The sea-basse (*Atractoscion nobilis* Gill) is one of the most highly prized of the fishes of our markets, so much so that its name is given to the flesh of other species. Thus sturgeon is usually sold in the restaurants under the name of "sea-basse," and that curious dish called "tenderloin of sole" is sturgeon again. The sea-basse is unfortunately not sufficiently abundant to supply the demand for it, and is sometimes absent from the markets for months together. It attains a considerable size, examples of from fifty to sixty pounds occur not infrequently, and individuals weighing seventy-five or even ninety-eight pounds have been brought to market. This species and *Genyanemus lineatus* are the only Sciaenidæ sufficiently abundant in our markets to be of importance as articles of food.

I have not yet been able to prove whether the cod of the Pacific Coast Cod-fishery is *Gadus auratus* Cope, or *G. macrocephalus*, as at present I have only seen the dried and beheaded examples prepared for market. Appleton's Cyclopædia gives the quantity of cod-fish taken in 1870, in Alaskan waters, at 94,750 quintals; whereas the total catch of last year amounted only to about 1500 tons, or less than one-third of the former amount. This would appear to indicate a great falling off in the quantity

of fish taken, but I can scarcely believe that this offers a sufficient explanation, as, although it appears that the trade was scarcely as extensive last year as in previous years, the dealers do not speak of any considerable diminution. It appears more probable that, as all the species of *Sebastes* (*Sebastichthys*, *Sebastomus*, *Sebastosomus*, and *Sebastodes* of Gill) are commonly called rock-cod, and the large green *Ophiodon elongatus* is known as "cod," that the quantities of these fishes brought fresh to market are, in the figures given in the Cyclopædia, included along with that of the true *Gadus*. The dried fish has about fourteen rays in the first, fourteen in the second and seventeen in the third dorsal; with nineteen in the first, and the same number in the second anal. The first dorsal is highest, the third shortest, and the base of the second anal is shorter than that of the first. The fishery is conducted in much the same manner as that of the Atlantic; the fish are taken by trawls in shallow water, by angle-lines in deep water, and are headed, split, cleaned and salted on board ship. The drying, however, is not done on the spot but is deferred until after arrival at San Francisco. Two large establishments for drying the fish are situated within ten miles of that city, and at one of them, at least, the fish are not dried in piles, but are kept in strong red-wood tanks framed together without nails, and dried as required by the market, which is principally local. A few of the fish are, however, exported to the Pacific shore of South America and to Australia.

The angle-line is almost exclusively used in the Sea of Okhotsk, where rather the larger part of the fish are taken, partly on account of the depth of the water, but partly because of the abundance, on the sand-banks, of a small Crustacean, called by the fishermen a "sand-flea," which attacks and devours the fish upon the trawl-line before it can be drawn. The species of *Orchestia* and its allied genera, as well as those of *Hippa*, are commonly called sand-fleas on this coast.

As has been remarked on the Atlantic coast, the fish are of better quality in deep water than on the more accessible banks, but as yet the fishery is entirely carried on in what would be called shallow water in the Atlantic. In the Sea of Okhotsk forty to fifty fathoms is about the usual depth, while at the Sheumagin islands, the principal fishing locality on the Alaskan coast, ten to fifteen fathoms is the usual depth. The trawls used in the

Alaska cod-fishery are often six hundred fathoms or three thousand feet long, and bear on each side a row of hooks at every half fathom, or thereabouts. The dried fish are sorted into three sizes, the largest are put up in wooden cases, the next size in bundles, while the small fishes are divested of their skin, vertebræ and fins, cut in halves, and packed in cases under the name of "boneless cod-fish." The fishery is about fifteen years old, and at this time about thirteen vessels are engaged in it; the smaller fore-and-aft rigged vessels are principally used in Alaskan waters, while the larger square-rigged vessels run to the Sea of Okkotsk. The schooners employed at the Sheumagin islands often make two or three trips in the season. About two hundred and fifty hands are usually employed by this industry. The fishermen are paid a fixed sum per thousand fish. At Kadak natives are engaged to head, split and salt the fish, earning from seventy-five cents to one dollar per day. A few years ago the dried fish were worth nine cents per pound, but at the present time the best quality is worth only four cents.

The Alaska cod-fish is first met with in Puget sound and its vicinity, but becomes more abundant farther north. Although the principal fishing grounds are the Sea of Okkotsk and the Sheumagin islands, extensive banks exist elsewhere, and local fisheries are carried on at various points in Vancouver island, British Columbia, and along the coast of Alaska, as, for example, at Wrangel. Neither the oil from the livers, the scunds or the tongues are at present utilized. In the stomachs of those opened, various kinds of small fish and squids are stated to have been found. The fishery is at present only in its infancy, its limited extent is not in any way due to the scarcity of the fish but to the struggle that has to be maintained with the eastern article, which has so far successfully excluded the Pacific fish from the regions east of the Sierras.

The same may be said of the halibut fishery. The fish is abundant in the northern waters and attains a large size, but though small quantities have been smoked and canned, the article cannot successfully compete, even in California, with that from the Atlantic.

THE FERTILIZATION OF OUR NATIVE SPECIES OF
CLITORIA AND CENTROSEMA.

BY WILLIAM TRELEASE.

A VISITOR to the Southern States in the early summer will notice among the most conspicuous flowers of dry, open wood-borders and fields, the two related leguminous species known to botanists as *Clitoria mariana* and *Centrosema virginiana*; the former a low vine, sometimes twining for a few feet up some supporting shrub; the latter a strong, slender twiner, not infrequently ascending to the height of ten or more feet. In accordance with its small size, the former has, as a rule, but one or two flowers expanded at a time, and they are of a pale purple, so that it is far outshone by its relative, whose entire length is often covered by bright purple flowers—not quite so large, to be sure, as those of *Clitoria*, but compensating for diminished size by increased number and depth of color—hence a shrub covered by this vine in full bloom is often an object of great beauty.

If we examine a flower of either species we find that its vexillum or standard (*s*, Fig. 1) is the lowest petal, while in most leguminous plants it is the uppermost when the flower is in the position which it naturally occupies on the plant; and this position allows it to serve in the species under consideration as an alighting place for insects.

An examination of the flower of *Clitoria* will show that the lateral borders of the horizontal standard are folded upwards to form a trough, this structure forcing insects to enter the flower on the median line and leading them directly beneath the keel (*k*). The uniform pale-purple color of the rest of the corolla is deviated from in this trough by the production of special guiding marks, which combine with the curvature of the standard to lead all insects into the flower in a constant direction. These marks consist of a yellowish spot near the apex of the standard, which narrows into a line following the middle line of the petal. From the base of this line radiate dark-purple lines on each side, their widest divergence being just below the widest part of the yellow line. The wing petals (*w*) are coherent with the keel at the point *p*, and beyond this point they diverge somewhat, thus aiding in a slight degree the upturned borders of the standard. The keel is split on its lower border, but when undisturbed the edges are

closely applied to each other. The filaments (*f*) are united, excepting on the side next the vexillum. Within the base of the filaments is a large nectar gland (*n*), broken on the side next the standard, and slightly five-lobed on its free surface, suggesting its homology with a whorl of five stamens. Through the break on its lower side and the breaks in the tube formed by the filaments, the abundantly-secreted nectar flows into the basal part of the standard, and it is to this that the guiding marks of this petal lead. The pistil consists of an elongated, stalked ovary (*o*) and a slender style terminated by an enlarged stigma (*st*), which usually protrudes slightly from the tip of the keel when the flower is expanded.

From its structure it may be predicted that this flower is designed to be fertilized by bees, but though I have often carefully watched dozens of plants growing together, for a long time, I have never seen a bee visit one of them, though I have sometimes noticed a swiftly-flying black bee (*Melissodes nigra*) flying nervously among the flowers, and I have no doubt that this species, at least, visits them for their honey. Once I saw a butterfly (*Callidryas eubule*) standing on the keel and having its proboscis inserted between the bases of the keel and the wing petals, thus reaching the nectar at the base of the standard. To show what would happen if a bee entered the flower, we may insert the end of a small pencil between the vexillum and the tip of the keel. First of all this comes in contact with the stigma, and this would take up any pollen on its upper surface. Differently from what occurs in the majority of leguminous flowers, the rigid keel and standard do not readily move apart by a wedging action between them, but as we insert the pencil a little farther it encounters the wings on either hand and forces these apart laterally. In doing this the sides of the keel are slightly pulled apart, owing to their union with the wings, and the pollen collected in the keel is allowed to fall upon the pencil. That this is what occurs in nature when a bee visits the flower, I think there can be little doubt; though a set of collecting hairs (Fig. iv, *h*) on the inner side of the style makes it appear probable that the keel is forced somewhat upward, so as to cause these to pump out a quantity of pollen. In Central Alabama, where these observations were made, a fair percentage of the flowers set fruit, but I am unable to say whether the plant is self-fertile or not.

In *Centrosema* the standard is either horizontal or considerably inclined, being nearly vertical in some cases; it is more nearly flat than in *Clitoria*, and its lateral margins are usually more or less noticeably bent downward. Near its base, on the middle

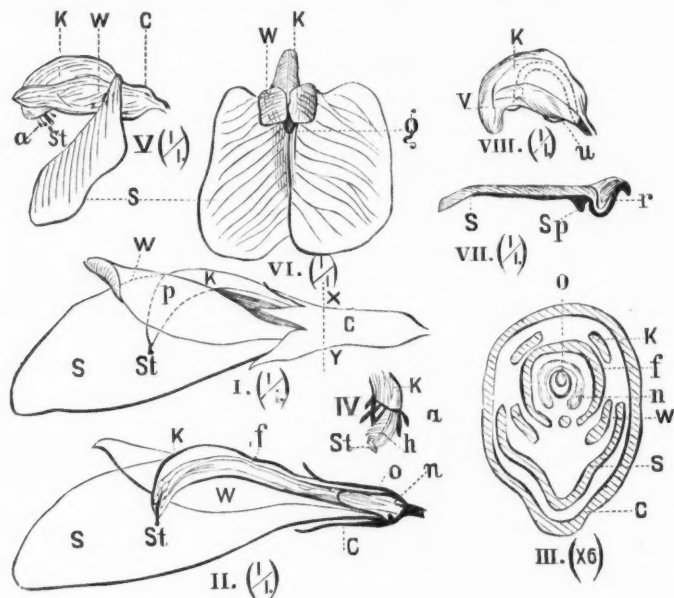


FIG. I.—Flower of *Clitoria mariana*, with nearer half of vexillum removed, natural size.

FIG. II.—The same with the nearer wing and the nearer keel petal removed, as well as a part of the staminal tube and the nearer half of the calyx.

FIG. III.—Cross section (diagrammatic) of Fig. I at *xy*.

FIG. IV.—Tip of the keel with the stamens and pistil unnaturally protruded, enlarged.

FIG. V.—Flower of *Centrosema virginiana* seen from the side, natural size. The keel is bent so as to expose the anthers and stigma.

FIG. VI.—The same from in front.

FIG. VII.—Vexillum of Fig. VI in longitudinal section, natural size.

FIG. VIII.—Keel after removal of the wings and standard, natural size. The dotted line indicates the position of the stamen and pistil.

In all of the figures *a* indicates the anthers; *c*, the calyx; *f*, the filaments; *g*, the guiding groove; *h*, the collecting hairs; *k*, the keel; *n*, the nectar-gland; *p*, the point of union of keel and wings; *r*, the nectar reservoir; *s*, the standard or vexillum; *st*, the stigma; *u*, part of the spring for retaining the keel in its normal position; *v*, the pouch for the stigma and anthers; *w*, the wings; *xy*, the point at which the section, Fig. III, is taken.

line, this petal has a guiding groove (*g*) of considerable depth, which connects with a slight cup (*v*) at the very base, this cup serving as a receptacle for nectar. On its lower surface, just in front of this receptacle, the vexillum is provided with a solid spur (*sp*, Fig. VII), which forms one character by which this genus is distinguished from *Clitoria*, but which seems to perform no function now. On the upper surface of the standard a white line, bordered on each side by fine lines of dark purple, runs from the basal guiding groove nearly to the apex of the petal, while others radiate from it on either hand, following the general direction of the veins of the standard. These marks, like those of the species last discussed, serve as guides to the nectar, which is poured into its receptacle, from a vaguely nine to ten-lobed annular gland, through the split in the staminal tube. The wings are coherent with the keel, are laterally inflated, and are so arranged as to prevent anything larger than the proboscis of a butterfly from reaching the nectar of the flower excepting by way of the guiding groove. The keel petals are grown together along both edges with the exception of a small space at their base and another at their apex. On the border next the vexillum, at about one-third the distance from its base to its apex, each keel-petal bulges outward to form an egg-shaped, thin-walled protuberance (Fig. VIII, *u*), the two being approximated on the median line. Half way between this and the tip, another common inflation (*v*) forms a closed pouch in which the stigma and anthers commonly lie, the style and stamens being strongly curved.

In reaching its head under the keel for the purpose of protruding its tongue into the nectar receptacle, through the guiding groove, a bee encounters the first-mentioned protrusion, which, with the inflated sides of the keel and the wings, acts as a spring, keeping the keel in its normal position, with the stigma and anthers concealed within it, in their pouch. But when this protruding pouch is pressed from below it bends the keel on its back and forces it slightly backward at its base, so that the stigma and anthers—which move but little—are protruded from the split apex of the keel and come in contact with the back of the bee. After the pressure is removed the elasticity of the parts returns them to their former position.

In spite of the guiding marks some insects fail to find the nectar. For example, one day in August an ichneumon-fly was seen

to try anxiously to find access to the honey of several flowers, but in every case it tried to enter at the side of the wings, and always failed. One large butterfly was seen to insert its proboscis at the side of the wings, and as it remained quietly standing for some time it probably obtained nectar. Several small butterflies alighted on the vexillum and ran their proboscides down the guiding groove, but necessarily failed to fertilize the flowers as they exerted no pressure on the keel. Many humble bees were seen to enter the flowers. Catching their anterior tarsi on the sides of the standard, they pulled themselves between this and the keel by sheer force, and then relaxing their hold, they protruded their tongues and feasted upon the nectar. In every case they caused the stigma and anthers to be exerted, and these always came in contact with their backs. Where flowers had been visited many times by these bees the sides of the vexillum, and especially near its base, were greatly scratched, and in some cases cut through by their sharp tarsal claws. When the bee left the flower the keel invariably returned to its former position so as to enclose the organs of fertilization. Hive bees were also seen to visit flowers of this species several times, and they acted precisely as the humble bees did, and with a similar result.

Quite a number of flowers were seen with large perforations (Fig. VIII) through both wing and keel, just back of the position commonly occupied by the anthers and stigma. As these did not allow access to the nectar, but did expose the pollen, I am inclined to think that they were made by some pollen-collecting insect—probably humble bees—though I was unable to see the openings made or used by any insect. In Alabama, where these observations were made, the flowers of this plant are largely fertile, but it was not determined whether they are self-fertile or not.

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RECENT LITERATURE.

CLARK'S ANATOMY AND PHYSIOLOGY OF THE LUCERNARIÆ.¹—American zoological science has, from the beginning, been especially lacking in histological investigations. The lamented author of the beautiful memoir before us, did far more than any one

¹ *Lucernariæ and their Allies*. A memoir on the anatomy and physiology of *Halicystus auricula* and other Lucernarians, with a discussion of their relations to other Acalephæ, to Beroids and Polypt. By HENRY JAMES CLARK, B.S., A.B. Smithsonian Contributions to Knowledge. Washington, September, 1878. 4to, pp. 130, 11 plates.

else to remove this reproach upon American biology. He was admirably adapted by nature for doing histological work, being cautious, careful, thorough and honest, and skillful in the technical and mechanical part of the work. But the present memoir, as well as many of Clark's other writings, evinces a thoughtfulness and grasp of the subject which characterizes observers of a high order, though he failed at times to record his observations in a style as terse and simple as that of some other writers.

Though this monograph bears as its date of publication, September, 1878, five years after the author's death, we received it in July of the present year. If we are to judge by the quality of the memoir, it is the most important zoological work (because involving so much hard labor and done with so much care) which has appeared in this country for several years, and we say this without disparagement to others.

The *Lucernaria* is a creature, not often met with, living attached by its tail or peduncle to eel grass or sea weeds just beyond low-water mark. The differences of opinion regarding its true position in nature, whether to be reckoned a jelly-fish or a type of a distinct order, led the author, who had paid so much attention to the Polyps and *Acalephs*, to devote time extending over several years to the full elaboration of its general and minute anatomy, its mode of development and relations to neighboring types of life. This has led to the preparation of an elaborate monograph, most carefully prepared, and illustrated by drawings which are not inferior in faithfulness, finish and artistic effect to those of any American, and few European delineators of the invertebrate animals. The text is divided into seven chapters; in the first, on individuality, the author discusses the subject of animal individuality, illustrating his points by reference mainly to the polyps and *acalephs*. The subject is sufficiently simple when the vertebrates are involved, but among the polyps, jelly-fishes, *Polyzoa* and *Ascidians*, where many forms are social, compound and often many-headed, it is difficult to say where the organ ends and the individual begins. The author clearly distinguishes between organs like those of the *Tubularians* and *Siphonophores* which have a high degree of individuality, and the individual joints (*proglottides*) of the tape worms; and does not fall into the error of regarding the former as truly individuals. The sexual and sexless organs of the *polycephalic Acalephs*, such as the *Tubularians*, "are necessary to make up a complete organism, *i. e.*, vegetative and reproductive, the one a complement of the other, neither *alone* can represent the *individual* unit, or whole cycle of life." We infer from the statement made that Clark regarded the so-called polymorphic individuals as "organs under various disguises;" a view which seems to us most reasonable. Clark ascribes a high degree of individuality to the jelly-fish, *Pelagia*, and only a less amount to *Lucernaria*.

The author in a third chapter attempts to point out an antero-posterior repetition of parts in the strobila of the Acalephs. In the fourth and fifth chapters a detailed account of the anatomy and physiology of *Lucernaria* is given. A number of new terms are adopted; among them *opsophragma* for the face-wall of *Lucernaria*, and *ectophragma* for the wall of the posterior face; *opso-myoplax* for the stratum of muscular substance immediately subtending the opsophragma. The bulk of the solid material of the body or musculo-gelatiniform layer is called the *chondromyoplax* (this is probably the mesoderm of recent writers); the gelatiniform layer is designated as the *chondrophys*. Particular attention is paid to the taxonomy of the tentacles, so characteristic a feature of these animals; and the fine structure of the marginal adhesive bodies (Colletocystophores) or anchors, is elaborated, and these bodies judged to be modified tentacles; certain other bodies (digituli) are carefully discussed and compared with similar bodies in the Acalephs. The digestive, nervous and reproductive systems are described, and then follows Chapter VI on embryology, comprising a description of the smallest specimen of *Halyclystus auricula* yet met with, which was one-sixteenth of an inch in diameter; but the development within the egg is not given. In the chapter on histology a discussion as to the nature of cells is introduced in a lengthy foot-note. Clark believed with other advanced histologists that "cells so called (no matter whether constituted according to the older histologists or according to the most recent theory), are, after all, of secondary importance, and that the *cytoblastema* (which we do not distinguish from intercellular substance) is in the main an *essential element*, the potential progenitor of all tissues, and that it projects itself into the utmost future of the living body by a process of self-proliferation." This cytoblastema, as Schwann (not Schwam, as printed in this memoir) called it, corresponds to the sarcode of Dujardin or protoplasm of recent authors, as he remarks incidentally that "all Rhizopods are moving, sentient masses of *Cytoblastema*, and that alone."

It is now generally believed, and has especially been insisted on by Hæckel that cilia are prolongations or extensions of the protoplasmic substance of the cells from which they arise. This discovery was first made by Clark and published by him as early as 1863. He then stated that "all vibratile cilia originate in the amorphous intercellular substance."¹ He then adds in the present memoir, which was written in 1869 and 1870, judging by the context: "This has particular reference to those cilia that cover cells which are fully developed, and have a distinct cell-membrane. It would be true, as a matter of course, in the opinion of those who hold that Infusoria are composed of *sarcode*, but

¹ See Proceedings of the Boston Society of Natural History, September, 1863, p. 283; and Annals and Magazine of Natural History, December, 1864.

apparently untenable if we admit with Kölliker, which we do not, that they are unicellular, while we deny that these cilia are direct prolongations of the cells which they seem to be so closely related to, we do not assert that they are always disconnected with some form of cell in the modern acceptance of the ideal cell. We do, however, believe that they are never the filiform proliferations of a distinct cell-membrane, however much they may appear to be so, but that in such cases they arise from the cytoblastema which overlies the cells."

That vibratile cilia are "individualistic in their movements at times, just as an arm or a leg is individualized" is claimed by our author, who remarks as follows: "Cilia are commonly treated of like masses of men in an army, all moving to one determined end, as if the recorder of their movements did not think that the animal possessing them had the discriminating power of controlling the actions of any one separately. As well might one claim that the numerous legs of a centipede are not capable of individual control." The beautiful figure given indicates the individuality of the cilia, and that they are "individually controllable."

The memoir ends abruptly with an account of the lasso cells or prehensile cysts (nematocysts and colletocysts), by which, as in most other Cœlenterates, the prey is benumbed and thus rendered more easy of capture. In 1863 Clark published the opinion that the nematocysts "have an intercellular origin, and do not develop within the cells which form the layer in which they are imbedded, but commence their career, *de novo*, by free-cell formation in the cytoblastema," the latter term referring, as we understand it, to the protoplasm or parenchym of the body. Description is also given of certain "tactile bristles," which he describes as "standing sentinel at the doors of the nematocysts to give warning of the approach of any foreign body."

The *Lucernariæ* were regarded by Clark as not being truly radiate animals, but as in a degree bilateral, with a fore and hinder end. The commonly received theory that the so-called *Radiata* are founded upon the idea of radiation, was combatted by the author in 1865.¹ He gives the following reasons: "We assume that, as in all the other four grand divisions of animals, the mouth is at the cephalic or anterior extremity of the body, and that all the rest of the organism is virtually, if not really, topographically behind it, and that whatever extends from the oral end of the body *does not radiate* from that end in two, three, four or five or more directions, but trends posteriorly in so many lines parallel-wise to a longitudinal axis, and to a vertical sectant plane which divides the body into a bilateral figure. To give the idea a reality, we have but to point to the mouth of an *Actinia*

¹ Mind in Nature, or the Origin of Life and the Mode of Development of Animals. By H. J. Clark. D. Appleton & Co. 1865.

as the cephalic end of our bilateral figure, and looking inwardly we shall see the flat stomach forming the sectant plane, which, extended in imagination in two opposite directions, would strike the periphery of the body along two dorsal and ventral lines one hundred and eighty degrees from each other, and then, projected still further away from the mouth, would terminate finally in the posterior, adherent discoid end. Parallel-wise with this plane all of the partitions of the digestive cavity trend, like a series of superposed shelves or galleries, in direct lines from the region lying right and left of the mouth, and of the flattened parallel sides of the stomach, backward along the inner face of the cylindrical periphery, so as to subdivide the included space into as many longitudinal corridors. It is these partitions which, by their multiplied sameness, constitute, among others, the elements that embody the dorso-ventrally repetitive type; the true ideal, as we firmly believe, upon which this grand division is founded.

"We think we shall be understood now when we say that the multitudinous chymiferous canals of the disciform *Æquorea* and the quadruple channels of the cylindrical bell of *Sarsia* are two widely separated extremes of dorso-ventrally repetitive sameness; or that the numerous ambulacea of *Solaster* and the five of *Asterias* represent two extremes of dorso-ventral repetition, thrown forward, 'into rank,' to the same line with the mouth; whilst the retreating rows of *Echinus*, and the more differentiated ones of *Spatangus* and *Schizaster*, and the like, present the idea in a less disguised form, to be finally exemplified, in its fullest expression and clearness, in the elongated vermiform *Holothuria*."

The views, in these days, of the most eminent naturalists, coincides with those of Clark, that radiation is, on the whole, a superficial feature, not always constant in Cuvier's *Radiata*, though often well marked. The type has been dismembered, though the radial symmetry usually present in the members of the Cœlenterates and Echinoderms is paralleled by the articulated or segmented disposition of parts in the members of Cuvier's *Articulata*, and in a less apparent but true sense in the Vertebrates.

Complete and elaborate as it is so far as it extends, this beautiful memoir was evidently designed to cover at least fifteen parts, as reference is made to several chapters composing Part xv, only two parts having an actual existence. A broken shaft would represent both the author's life and this posthumous work, each symmetrical and thoroughly finished to the point where they suddenly broke off.

RECENT BOOKS AND PAMPHLETS.—*Appunti Ittiologica sulle collezioni del Museo Civico di Genova.* Per D. Vinciguerra. I. Enumerazione di alcune specie di pesci raccolti in Sumatra dal Dr. O. Beccari, 1879. (Ext. from *Ann. del Mus. Civ. di Stor. Nat. di Genova.*, Vol. XIV, 10 Maggio, 9 Giugno, 1879.) 8vo, pp. 14. II. Intorno ai *Macrurus* del Golfo di Genova. (Tav. II.) (Ext. from the same journal, Vol. XIV, Agosto, 1879.) 8vo, pp. 19. From the author.

The Extinct Birds of Rodrigues. By Dr. A. Günther, F.R.S., and Edward Newton, C.M.G., M.A., F.L.S. 4to, pp. 15, pls. XLI-XLIII. London, no date. From the authors.

[Zoology of Rodriguez.] Reptiles. By Dr. Albert Günther, F.R.S. Fishes. By the same author. 4to, pp. 3. London, no date.

The Extinct Reptiles of Rodriguez. By Dr. Albert Günther. 4to, pp. 5. London, no date.

List of the Mammals, Reptiles and Batrachians sent by Mr. Everett from the Philippine islands. By Dr. A. Günther, F.R.S. 8vo, pp. 74-79, pl. IV. (From Proc. Zool. Soc. of London, Jan. 14, 1879.)

On Reptiles from Midian, collected by Major Burton. By Dr. Albert Günther, F.R.S. 8vo, pp. 977, 978, pl. LXII. (From Proc. Zool. Soc. of London, Dec. 3, 1879.)

Notice of a Collection of Reptiles from the Islands of Torres Straits. By Dr. Albert Günther, F.R.S. 8vo, pp. 84-87. (From Ann. and Mag. Nat. Hist., Jan., 1879.) London.

On two new species of Fishes from the Bermudas. By Dr. A. Günther. 8vo, pp. 2. (From Ann. and Mag. Nat. Hist., Feb., 1879.) London.

Preliminary notices of Deep-sea Fishes collected during the voyage of H.M.S. *Challenger*. By Dr. Albert Günther. 8vo, pp. 24. (From Ann. and Mag. Nat. Hist., July, 1878.) London.

Description of four new species of *Chamaeleon* from Madagascar. By Dr. A. Günther, F.R.S. 8vo, pp. 148-150, pls. XI-XIII. (From Proc. Zool. Soc. London, Feb. 18, 1879.) This and the preceding from the same author.

The Quarterly Journal of the Geological Society, Vol. XXXV, No. 139 part 3. 8vo, Aug. 1, 1879. London. From the Society.

The Journal of the Franklin Institute, Vol. CVIII, No. 644, Aug., 1879. Philadelphia. From the Institute.

Annual Report upon Explorations and Surveys in the Department of the Missouri. By E. H. Ruffner, Lieut. Eng. U.S.A. Being Appendix SS of the Annual Report of the Chief of Engineers for 1878. 8vo, pp. 1749-1867, pls. 8. Washington, 1878. From the Department of the Interior.

Proceedings of the Academy of Natural Sciences of Philadelphia. 8vo, pp. 153-184, 1879. From the society.

Ursprung und Stammverwandschaft der Ctenophoren. [Verbal communication.] By Prof. Haeckel. 8vo, pp. 10. (Ext. from Sitzungsberichten d. Jenaischen Gesell. f. Med. und Naturwissenschaft, 16 Mai, 1879.) From the author.

Bradybates ventricosus (Tschudi) est synonyme de *Pleurodeles walt'ii* (Mich.). Par Fernand Lataste. 8vo, pp. 8. (Ext. des Actes de la Soc. Linnéenne de Bordeaux, 2 Mai, 1879.) From the author.

Ichthyografiske Bidrag. VII Tillægsbemærkninger om Sugefiske og Sværdfiske. Af Dr. Chr. Lütken. (Ext. from Vidensk. Medd. fra den Naturhist. Foren. i Kjöbenhavn, 1877.) 8vo, pp. 2. From the author.

Smaa Bidrag til Selachiernes Naturhistorie. (Om vanskabte Rokkeformer; om Havkalens Forplantning, om Brugdens tidligere Forekomst ved Island og foregivne Forekomst ved Grönland; samt om den mellemamerikanske Ferskvands-Hai.) Af Dr. Chr. Lütken. (Ext. from Vidensk. Medd. fra den Naturhist. Foren. i Kjöbenhavn, 1879-80.) 8vo, pp. 24. From the author.

Ueber einige neue und seltene Fischarten und den K. K. zoologischen Museen zu Wien, Stuttgart und Warschau. Von Dr. Franz Steindachner. (Ext. from Denkschriften d. Mathematisch Naturw. Classe d. Kaiserl. Akad. d. Wissenschaften.) 4to, pp. 52, 97 af. Wien, 1879. From the author.

Scientific Lectures. By Sir John Lubbock, Bart., M.P., etc. 8vo, cloth, pp. 187, 1 plate and 30 figures on wood. Macmillan & Co., London, 1879. From the publishers.

Zoölogical Record for 1877; being volume fourteenth of the Record of Zoölogical Literature. Edited by Edward Caldwell Rye, F.R.S., etc. 8vo. London, 1879. From the editor.

Palæontographica. Beiträge zur Naturgeschichte der Vorzeit. Sechszwanzigster Band oder dritte Folge. Zweiter Band. Erste und zweite Lieferung. Edited by Wilh. Dunker and Karl A. Zittel, assisted by Benecke, Beyrich and others. 4to, pp. 50, pls. XIII. Theodor Fischer, Cassel, (June), 1879. From the publisher.

The Peduncular Tracts of the Anthropoid Apes. By Edward C. Spitzka, M.D. (Ext. from the Journ. of Nervous and Mental Disease, July, 1879.) 8vo, pp. 27. New York. From the author.

The Outer ear of *Blarina brevicauda*. By Dr. Elliott Coues, U.S.A. (Ext. from American Journal of Otology, Vol. 1, July 18, 1879.) 8vo, pp. 2. New York, Wm. Wood & Co. From the author.

Catalogue of Scientific Serials in the Library of Harvard University. Samuel H. Scudder, Cambridge, 1879. 8vo, pp. 358.

Resources and Attractions of Utah. Prepared by the Utah Board of Trade. Omaha Republican Publishing House, 1879. 8vo, pp. 74.

Writings of Samuel Hubbard Scudder. Published by the editor, George Dimmock. Cambridge, August, 1879. 8vo, pp. 28.

Note sur le *Breyeria Borinensis*. Par A. Proudhomme de Borre. (Extrait des Comptes-rendus de la Société Entomologique de Belgique. Séance du 7 Juin, 1879, Bruxelles.) 8vo, pp. 6.

Principal J. W. Dawson's Criticism of my Memoir on the Structure of *Eozoön Canadense* compared with that of Foraminifera. (From the American Journal of Science and Arts, Vol. XVIII, September, 1879.) By K. Möbius. 8vo, pp. 10.

Report of the Entomologist, Department of Agriculture, Charles V. Riley. Washington Government Printing Office, 1879. 8vo, pp. 52.

De la Meilleure Disposition a donner aux Caisses et Cartons des Collections d'Insectes. Par A. Proudhomme de Borre. (Extrait des Annales de la Société Entomologique de Belgique Séance du 5 Avril, 1879, Bruxelles.) 8vo, pp. 4.

Naturgeschichte Cubanischer Schmetterlinge Nach Beobachtungen des Herrn Dr. Gundlach bearbeitet. Von H. Dewitz. Zeitschr. f. d. ges. Naturwis. Bd. LI, 1879. 8vo, pp. 20.

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GENERAL NOTES.

BOTANY.

SIR JOHN LUBBOCK ON SEEDS.—At the last meeting of the British Association Sir John Lubbock read an interesting paper on seeds. He commenced by calling attention to the difference presented by seeds, some being large, some small, some covered with hooks, some provided with hairs, some smooth, some sticky, &c. He gave the reasons of these peculiarities, and then spoke of the modes of dispersion, by means of which seeds secured a sort of natural rotation of crops, and in other cases were enabled to rectify their frontiers. Some plants actually threw their seeds, some were transported by the wind, and many were provided with a wing which caught the wind. Dispersion was also effected by the agency of animals. This means was divided into two classes, where seeds adhered to animals by hooks, and where the same purpose was effected by sticky glands. The next point touched upon was, that seeds found themselves in spots suitable for growth. Most seeds germinated on the ground, but there were instances, as the mistletoe, where they were parasitic on trees. Such seeds were imbedded in a viscid substance, so that if dropped by a bird on a bough they adhered to it.* In some cases plants

buried their own seeds, and in other instances the seeds buried themselves, the means by which these processes were effected being fully explained by Sir John, who, in conclusion, called attention to mimicking seeds, such as the *Scorpiurus*, the pods of which did not open, but looked so exactly like worms that birds were induced to peck at them and thus free the seeds. That this was the purpose of the resemblance he would not assert, but he threw it out as a matter for consideration.

THE FRUIT OF *SHEPHERDIA CANADENSIS*.—In the same locality as *Prunus pumila* (p. 649) is found *Shepherdia Canadensis* Nutt., whose fruit differs from the description commonly given. Gray's Manual states that it is "yellowish-red, insipid;" Wood's Class Book, "Berries oval, scaly, sweetish to the taste;" Nuttall, who originally described it, "Berries squamose, sweetish but scarcely edible." The berries are pleasantly acid, followed, however, by a slightly bitter taste if the skin be retained in the mouth. The color is scarlet, in this respect, as well as in the globular form and the size, closely resembling the common red currant. A dish of them would at first sight be taken for currants by almost any one. The bushes bore abundance of fruit this year, which is rather uncommon, and except in leaves, strikingly simulated well-loaded currant bushes. Bringing some home in fruit, and showing them to some children before allowing them to be tasted, they were at once said to be currants, and were eaten with a relish, showing that the children do not agree with the botanists, if these are typical berries. They are sparsely covered with scales in the form of the brown radiating hairs so abundant on the under side of the leaf, that form such pretty objects under the microscope. The description of the fruit of the buffalo berry of Upper Missouri (*S. argentea* Nutt), "edible, acid, scarlet," really answers more correctly for this. The plant does not seem to vary otherwise from the ordinary description.—E. J. Hill.

POTAMOGETON NIAGARENSIS TUCKERMAN.—The only locality for this plant given in Gray's Manual is "Rapids above Niagara Falls." I do not find it mentioned in other books. It occurs abundantly at South Chicago in the Calumet river, and in the pools and ditches that drain into it from Englewood eastward. It is usually in rather shallow water, often forming dense masses filling the water to the depth of several inches, and fruiting freely. In a note from Dr. Gray it is said to occur in other parts of Illinois. The plant seems a little more slender than that described in the Manual, with narrow leaves. But the "short, club-shaped, compressed peduncles," the "capitate 8-12 flowered spikes," though hardly "*few*," and the "roundish, compressed fruit, with a winged and toothed keel and angled face," and the "convolute, uncinat seed," define it clearly. It comes into fruit by the middle of June and continues throughout the summer.—E. J. Hill.

THE *HOUSTONIA ROTUNDIFOLIA* PRODUCING DOUBLE FLOWERS.—Though Chapman limits the *Houstonia rotundifolia* Michx., to "sandy soil near the coast," I found it quite common in the central or lake region of Florida. At Santa Fe lake, Fla., on January 14, 1878, I met an instance of this plant producing double flowers. Each beautiful little snow-white blossom was so crowded with petals as to form a perfect tiny rosette; the other parts varied in there being three pistils having exerted styles, while there were five included stamens. Several of the inner petals also were tipped with anthers, resembling the same feature in the water-lily. The plant grew under an old fence, the rails of which were partially decayed; but there were otherwise no artificial surroundings to which the peculiarity might be ascribed. The dimorphous character of the flowers in the genus *Houstonia* is worth recalling in this connection, and it is further noteworthy that the species under consideration bears apetalous fruiting flowers throughout the year.—Henry Gillman, *Detroit, Michigan*.

A SUGGESTION.—To mark the relative frequency of species in a local flora the botanists always use the terms, common, abundant, frequent, scarce, rare, very rare, etc. This is not sufficient when we intend to give a characteristic view of the vegetation of a certain district. As it is impossible to count the single individuals of each species, we should try to find out approximate proportions of the species to the whole mass of vegetation after the method which was first (in 1848) proposed by Prof. Schnitzlein in his valuable book on the vegetation of the Jura and Keuper formation. Suppose a distance of one hundred square miles divided into ten equal parts of ten square miles each. We would mark a species which occurs in each of those parts with the Roman figure x, when only in five with v, when only in one with i, etc. This would show the distribution of a plant over the whole area in question. Of course when a plant grows only in swamps, or on prairies, or in woods, these figures would indicate only the occurrence in so many parts of swamp land, prairie land, or wood land, and it would be necessary that the flora be accompanied by an accurate topographical map on which were marked the limits of wood land, swamp land, prairie land, cultivated land, etc., or else the proportion of these different soils to the whole area should be indicated. The relative number of each species in each locality could be marked by an Arabic figure from 1 to 10. So 1. 1 would mean only a single specimen found on a single locality, 1. 2 a few specimens, 1. 3 a limited number, and so on to 10, which would mean an immense number.

A plant marked 1. 1, especially when inconspicuous, would be no indication of the character of the landscape and another marked 11. 2 neither, when those marked with x. 10, x. 9, ix. 10, ix. 9, etc., would be of a decided influence, giving the view a

prominent stamp. Small inconspicuous plants, for instance, *Eleocharis avicularis*, act upon the sight only in large masses (be it by millions), when a much smaller number (thousands) of woody species, for instance *Quercus alba* or *Corylus americana*, may have the same effect. Both the former and the latter we would mark by 10, as we do not count the exact number of individuals but the manner in which they strike the sight. For the intention of this method is not only to give the relative frequency of each species, but at the same time to show what part the species does play in the whole vegetation of a certain district as presenting itself to our view.

Besides these designations the geological character of a locality could be marked by the letters A, B, C, etc.

This simple method, which requires not much space in a book, would be a valuable improvement in our floral catalogues.—*Fred. Brendel.*

BOTANICAL NOTES.—There has lately been on exhibition in the window of the office of the *Providence Journal*, a magnificent fasciated specimen of the golden-banded lily of cultivation, bearing one hundred and thirty-seven blossoms. The stem is flattened in the usual way when this teratological phenomenon is seen.—The attention of botanists is called to an important contribution to American botany by Mr. Sereno Watson. It is published by the American Academy of Arts and Sciences, and is entitled a Revision of the North American Liliaceæ. It evinces the usual painstaking care and discrimination of its author, and will be welcome to the many students who have wandered through the chaos hitherto existing in this family. Many radical changes are made, but none, we believe, which will not be found for the better; certainly none for which good reasons could not be given. To instance two of these, the genus *Uvularia* retains the species *perfoliata* and *grandiflora*, while *sessilifolia* and *puberula* are brought under a genus *Oakesia*. The genus *Milla* mostly disappears in *Brodiea*. A second portion of the same pamphlet describes a number of new species of various orders, the whole followed by a carefully prepared index.—*W. W. Bailey, Providence, R. I.*

THE SEA-WEEDS OF SALT LAKE.—The attention of the visitor to the shores of the Great Salt Lake, Utah, is sometimes attracted by the small masses of Algæ which are seen to be suspended in the brine, and to be cast ashore in little windrows on the sandy shores. Four years ago, while connected with Hayden's U. S. Geological Survey of the Territories, I made an investigation of the life of the Great Salt Lake, especially of *Artemia fertilis* and *Ephedra gracilis*, and took pains to collect in alcohol, and also dry, specimens of these Algæ, as they had been unnoticed by botanists and collectors so far as I am aware. It is probable that

these Algæ are almost the only source of food for the brine-shrimp, as they are diffused through the water in nearly equal abundance with the Crustaceans themselves, and in no case that I could see, grow attached to any objects in the lake or on the shore. The most common form is a rounded mass which lives suspended in the water.

Specimens of the Algæ collected were sent to Prof. W. G. Farlow, of Harvard University, from whom the following preliminary report has been received:

"The Algæ which you collected in Salt Lake are very interesting and, as far as I know, are the first which have ever been collected in that locality. Mr. Sereno Watson, the distinguished botanist of the King Survey, tells me that he examined a portion of Salt Lake for Algæ but without success, and thinks it probable that very few plants will be found in the lake. The specimens you sent comprise two small packages of dried material and a small bottle of alcoholic specimens. The alcoholic material is scarcely determinable, as the specific characters of Algæ, such as would be expected to occur in Salt Lake, are generally lost by immersion in alcohol. The dried material I have soaked out and examined.

"It consists largely of grains of sand and remains of small animals, mixed with which are three species of Algæ. The most abundant Alga is one which forms irregular gelatinous masses sometimes attaining a diameter of half an inch. The color, apparently much faded in drying, is brownish with a tinge of bluish-green.¹ It seems to me to be a species of *Polycystis*, and I am unable to refer it to any of the described species and have called it provisionally *Polycystis packardii*. Its distinguishing characters are the oblong shape of its cells, which are smaller than in any of the marine species of the genus which I have examined, and the firmness and lobulated form of the gelatinous substance in which they are imbedded. Besides the *Polycystis* is a species of *Ulva*, using the word in the extended sense adopted by Le Jolis, which is in fragments, so that one can form no very accurate idea of its habit. The microscopic characters, however, show that it is, with scarcely any doubt, *Ulva marginata* Ag., found on the coast of Europe. The specimens from Salt Lake agree very well with specimens from the French coast, which are considered by Le Jolis to be the species described by Agardh. The third Alga from Salt Lake is much less abundant than the others in the packages sent, and is also in poor condition for comparison with herbarium specimens. It is a species of *Rhizoclonium*, and it comes very near to *R. salinum* Ktz. (*R. riparium* Harv.), a common marine species of this country and also found in Europe near salt springs. The Salt Lake plant has smaller cells and approaches *R. kochianum*, a species also marine and found in saline regions.

¹ The color in life is an olive green,—A. S. P.

"You will see then that two of the three species are recognizable as marine forms, while the third, in my opinion now, is at least not to be referred to a known marine form. As a rule, the Algæ found in saline regions belong to species found in brackish waters on the coast. One might expect to find a large variety of Ulvæ and Conserveæ in Salt Lake, and it would be of interest to see how closely these inland forms approximate to the littoral forms of the eastern and western coasts."—*A. S. Packard, Jr.*

BOTANICAL NEWS.—The *Botanical Gazette* for September prints an article by Prof. J. T. Rothrock on the staining and double staining of vegetable tissue.—*Grevillea* for September contains an account, by W. L. Lindsay, of experiments on the colorific properties of lichens.—In Trimen's *Journal of Botany* for September, Mr. S. LeM. Moore discusses in an interesting way the mimicry of seeds and fruits, and the functions of seminal appendages, pointing out the resemblance of certain seeds to insects, spiders and shells. He concludes that "the insect-mimicing fruit or seed may escape from its seminivorous enemies by being passed over as an insect; moreover, insectivorous ones seizing it and finding out their mistake would be almost certain to fling it some distance away, by which means the species would stand a better chance of dispersion."

ZOÖLOGY.¹

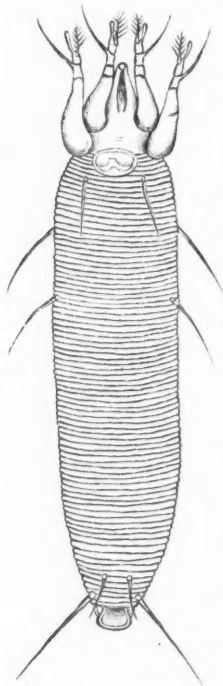
SUCCESSIVE APPEARANCE OF CHIROCEPHALUS AND STREPTOCEPHALUS IN THE SAME POND.—The pond at Woodbury, N. J., from which the types of a new species of the first-named genus were obtained, and which I called *C. holmanii*, has recently yielded specimens of a large species of Streptocephalus, which I have named *S. sealii*. Mr. W. P. Seal, who collected for me specimens of both species, tells me that Chirocephalus was very abundant, and Streptocephalus, though numerous, was not as plentiful. The consecutive appearance of these two species, the first in spring and the latter late in summer, in the same pond, seems to me worthy of record. The pond dries up during dry weather, and is not more than fifty feet in diameter. Mr. Seal, whose opinions I have learned to value very highly in reference to such matters, suggests that it is not improbable that wading and water birds carry the eggs of these branchipods and other water organisms, from place to place, in the mud or other material adhering to the feet and body.—*John A. Ryder.*

A THIRD LOCALITY FOR EURYPAUROPUS.—On the 20th of September last, I found specimens of the above-mentioned genus under sticks and leaves, in considerable abundance, at a place on the west side of the Schuylkill river, about a mile north of the

¹The departments of Ornithology and Mammalogy are conducted by Dr. ELLIOTT COUES, U. S. A.

most northern locality first discovered. Neither larvæ nor adults differed in any way from those found earlier in the year.—*John A. Ryder.*

A PROBABLE NEW SPECIES OF PHYTOPTUS OR GALL-MITE.—Prof. Wm. Barbeck recently handed me a slide containing specimens of a very small mite found by him on the leaves of a maple. Upon examining the slide carefully with a power of 550 diameters, I was enabled to make a pretty fair camera sketch, which I have compared with all of the figures of the other species to which I had access, and I am led to infer therefrom that it is a new species, but shall not name it on account of the fact that those



hitherto known and described, have, for the most part, been very poorly characterized. The accompanying figure of this creature will give a good idea of its appearance. It measures not quite the $\frac{1}{16}$ of an inch in length, and is almost perfectly transparent. It is found in vast numbers on the leaves of the maple, under a forest of epidermal growths, crowded together and consisting of minute disks supported on pedicels. These growths have been considered fungoid in nature under the name of "*Erineum*," but are, in reality, hypertrophied hairs, and it is now well known that they are caused by very minute four-footed mites belonging to a very singular family known since the time of Dujardin as *Phytoptidae*. When these creatures produce galls they are always open, the opening being on the under side or edge of the leaf, and are clothed inside with hairs, amongst which the mites browse heads downward.

Whilst there can be little doubt that *Phytoptus* is allied, as Murray observes, to the eight-legged itch-mites, the vermiform abdomen, which is almost wholly occupied with the reproductive function, according to Landois and Briosi, one cannot help being struck by its resemblance, in this regard, to the degraded crustacean *Penella*, parasitic upon the marine sun and parrot fishes, and which also has an elongated vermiform, annulate abdomen also wholly given up to reproductive purposes. It appears to me not improbable that we have, in these two cases, an instance of the *homoplasy* spoken of by E. Ray Lankester. That is, that creatures widely removed from each other in the system, may become similar in structure through the prolonged influence of similar conditioning causes.

The principal characters which seem to distinguish the form here figured from others, are the robust basal joints of the legs and the long tenant hairs of what are probably the first tarsal joints; though I am not sure that these are specific characters, and it will be impossible to decide until the group has been specially studied. Meanwhile, the figure of the above-described *Phytoptus*, observed by me, may be of use to some specialist interested in revising the group.—*John A. Ryder.*

THE ENGLISH SPARROW (*Passer domesticus*).—Every fact touching the relations of the English sparrow to our native birds should be put upon record, to the end that a just conclusion may be reached in regard to its character. During the present month (June, 1879) Hon. Wm. H. Upson, of Akron, called my attention to the fact that a box erected for birds in his yard had, in the spring, been occupied by the sparrows; that the house-martins had taken forcible possession, driven out the sparrows and were then occupying the box, which the sparrows were constantly endeavoring to regain. Going to his grounds I found one of the martins sitting as a sentinel at the door of the box, and in a few minutes the sparrow appeared with materials for nest-building in its bill, hanging around apparently waiting for an opportunity to enter the box; it never tried to enter while the martin was sitting in sight at the door, but as soon as the passage seemed clear, made the attempt; it was every time driven away by the martin. I watched the controversy for an hour, during which many attempts were made to gain possession. The sparrow never called for re-inforcements, but twice the martin gave a sharp call which brought several others to his assistance. It was very evident that the martin was able to hold the fort.

Mr. Upson has many trees and much thick shrubbery in his yard, and although his grounds are in the city of Akron, they are filled with a large variety of our native birds, and he reports that they are all fully able to take care of themselves in the presence of the sparrow, but suggests that in large numbers the sparrows may induce a bird famine, and in that way alone tend to diminish the number of our native birds.

Prof. Elizur Wright, of Mass., was the guest of Mr. Upson at the time of my visit, and was much interested in the controversy between the sparrow and the martin. He stated that in his grounds at Medford, near Boston, the sparrows from the city attempted to take possession of boxes erected for the blue birds and the white-breasted swallow, but were driven away from the boxes and off from the grounds by these native birds. He reported the following birds as frequenting his grounds and a clump of forest adjacent to them, blue bird, white-breasted swallow, scarlet tanager, wood thrush, summer yellow bird, red start, song sparrow, chipping sparrow, grass finch, cat bird, brown thrush, gold finch, indigo finch, house and wood phoebe,

towhee bunting, Baltimore oriole, orchard oriole, white-eyed vireo, red-eyed vireo, fly catchers, king bird, cuckoo, etc. He also states that in his grounds the red squirrel is a great plunderer of the eggs of the birds.

July 8.—The sparrows in Mr. Upson's grounds have finally regained possession of their box. Mr. Upson informs me that they never made a direct attack upon the martins, but watched the box continuously for many weeks, and at every possible opportunity carried nest-building materials into it, until the patience of the martins was exhausted, their associates were called together in consultation, and the box abandoned.—*M. C. Read, Hudson, O.*

DESTRUCTIVENESS OF ENGLISH SPARROWS.—I am informed by Mr. John M. Shorten, of Cincinnati, Ohio, of a humming-bird brought to him to be mounted, which had been killed by English sparrows. A friend of Mr. Shorten witnessed the attempts of the pests to destroy the little hummer, but unfortunately did not succeed in rescuing it until life was nearly extinct.—*Elliott Coues, Washington.*

CURIOUS HABIT OF THE ENGLISH SPARROW.—I have recently noticed what seemed to me a curious habit of our English sparrow. On several occasions whilst walking through the city, I have seen them take potato bugs and other insects when on the wing, after the fashion of swallows.

I have also repeatedly noticed these sparrows climbing tree trunks in spirals exactly like a creeper, stopping at intervals to pick up insects and the nests of our common yellow caterpillar from the interstices of the bark. Sometimes the bird would flutter to the ground and reascend, sometimes go from the ground to the lower branches and then try another tree.—*J. R. Taylor, M.D.*

SWALLOWS FEEDING ON BAYBERRIES.—During a visit at Beach Haven, N. J., I noticed, September 10, 1878, great flocks of swallows, which I took to be *Cotyle riparia*.

I saw them alighting by millions on the bare sand flats, whole acres being covered at once; some coming, others going, and all as they sat, facing the wind.

The ground from which they had just flown was, of course, dotted with their freshly dropped excrement, and I was astonished to find therein the hard seeds of the bayberry (*Myrica cerifera*). I at first refused to believe the obvious inference, supposing it to be a settled fact in natural history that swallows were wholly insectivorous. But from further observation the conclusion seemed inevitable that they had fed upon the bayberries. I learned, moreover, that they had been seen to alight upon the bushes, which were afterwards found to be stripped; and the opinion was expressed by old residents of the place, that the swallows were attracted there by the berries. I was anxious to

pursue the subject further but was obliged to leave next morning. Some of my friends, however, endeavored to procure me specimens for identification, but failed to find them. The birds were probably on the eve of migration, and arranging therefor. Perhaps their ordinary pabulum is too quickly digested to support them on their flight, and they therefore instinctively lay up a store of more durable food.—*James Alinson.*

NOTES ON THE SLAVE-MAKING ANT.—For the past three years I have been observing a large colony of slave-making ants (*Formica sanguinea*). The formicary is in the grove which surrounds the house, thus affording me an excellent opportunity to see the battles and raids upon other species, and to note their curious proceedings in many other respects.

On August 1st and 2d I witnessed the greatest battle I ever saw between the slave-makers (*F. sanguinea*) and the black ants (*F. fusca*). The distance between the two colonies was one hundred and twenty feet. The immense number of individuals composing the colony of slave-makers may be partly estimated by seeing them on the war path, which was about one foot in width and one hundred and twenty feet in length—not thinly scattered but a vast moving phalanx.

The battle-field was about twenty-five or thirty feet in circumference. The blacks were a grand army that would not flee, and the ground was soon literally covered with the combatants.

It is stated in the August number of the AMERICAN NATURALIST, page 526, that by means of the microphone Mr. T. S. Tait has been able to hear the roar of a black ant when attacked by its companion. When the ants were first attacked in this great battle, I certainly heard a roar without the aid of a microphone! Was it the busy tramping feet that I heard? The roar—I do not know what else to call it—lasted only a few moments, whereas the battle lasted four or five hours before the reds gained possession of the vast nurseries of the blacks. It took them nearly two days (they cease work at night) to transport the pupæ and the mature prisoners to their own dominions.

It is a singular fact, that in all the battles which I have witnessed during the past three years the reds have never been repulsed by the blacks, but have always come off victorious. I think the main reason why the blacks are so easily slaughtered is the fact that they never let go their hold on their adversary. A black ant will fasten its mandibles upon a leg of the red warrior, another red cuts the head off, and it is not uncommon to see as many as three black heads hanging to the legs of one of the reds, while the headless trunks of the blacks are strewn thickly over the ground. Very few reds are killed compared with the blacks.

The blacks are not the only species which the slave-makers attack. The brown ant (*F. schaufussii*), and the yellow variety

(*F. schaufussii* var. *americana*), both fall victims to their insatiate rapacity. Large numbers of these brown and yellow ants are reared in the slave-making colony, and they make excellent nurses for their masters. They also make raids upon two species of *Aphaenogaster*, but these do not remain long with their captors. But I am happy to state that there are two species of ants in the grove which the red marauders dare not attack—*Camponotus melens* and *Polyergus lucidus* they never attack, however small or weak the colony.—*Mary Treat*.

NOTES ON PACIFIC COAST MAMMALS.—The curious case of a breed of one-toed hogs, mentioned by Dr. Coues, is paralleled, at least in an individual instance, by that of a one-toed deer, the four feet of which were presented recently to the California Academy of Science. Unfortunately the only parts sent were the metatarsals and toes, so that it would be difficult to be certain of the species further than that it was a *Cariacus*. The deer was killed in Mendocino county, Cal., but no information as to the existence or non-existence of others resembling it has yet been obtained. In all cases the third toe was the only one utilized for progression, but the extent of the development of the fourth toe differed in the respective feet.

Mr. Chapman, a taxidermist of San Francisco, has a deer horn which is eighteen inches long, has an external basal prong five and a-half inches long and an internal posterior prong four and a-half inches long, branching off six and a-quarter inches from the slightly re-curved tip of the main antler.

In the collection of Mr. Lorquin, another taxidermist of San Francisco, there was, not long since, a very large pair of horns of *Cervus canadensis*, full grown yet with the velvet still perfect. The left horn measured four feet eleven inches along the curve, the right, about an inch less. The right had four branches near the base, and divided into four prongs at the crown; while the left had but three basal prongs and three coronal branches. The distance between the horns at their greatest outward curvature was three feet eight inches, and the tips were two feet six inches apart. Will some reader of the NATURALIST kindly inform me whether similar differences between the two horns of this species are the rule or the exception; and also whether the large palmated anterior basal prong of the male reindeer's horn usually occurs on one horn only or on both?

The lynx of Alaska, which I suppose is *Lynx canadensis*, appears to attain very large dimensions, since the largest among several large ones in the possession of Mr. Blunt measured four feet one inch from the tip of the nose to that of the tail. This gentleman had also an albino gopher of a dirty white tint. By the term "gopher" I do not mean the *Spermophilus*, which is often miscalled by that name, but the true gopher (*Thomomys bulbivorus*).—*W. N. Lockington*.

HABITS OF SPERMOPHILUS RICHARDSONI.—I have received the following interesting communication, which gives some new light upon the hibernation of this species.—*Elliot Coues, Washington, D. C.*

FORT ELLIS, MONTANA, Sept 8th, 1879.

Dr. Elliott Coues, U. S. Army, Washington, D. C.

SIR:—So little has been written in regard to the so-called "gopher" (*Spermophilus richardsoni*), at least that I have seen, that a few facts which have come under my own observation may be welcome to you.

I have always supposed that the gopher hibernated, but during the winter of 1878-79, while stationed at Fort Custer, Montana, I often saw them in December, January and February, playing about on the snow, which had been trodden down for a few feet around the entrance of the burrows. Small zig-zag paths led from hole to hole, showing that their sociability was continued during the winter. Some of the holes noticed had no foot-marks around them, being clean, circular openings in the snow, as if the gophers had burrowed up to the surface from below, and then found it too cold to come out. Those observed were seen when the day was bright and warm, usually about noon. When a new snow fell and covered the holes, the gophers remained inactive for some days, at least until the storm was over, and then came out to sun themselves. From some of the holes no gophers were seen during the winter, while from others they were noticed almost every pleasant day during that season. I have seen no young ones except in June and early in July; the smallest ever seen were noticed about the middle of last June, while I was walking a short distance from this post. I then saw them only a few yards off, a female with three young, gamboling in the sun, very much like young kittens. One was noticed running around after its own tail, as I have seen kittens doing. At my approach the old one disappeared in the burrow with the usual squeak and suggestive flirt of the tail; the young ones stopped their play and regarded me with much interest, yet manifested no disposition to escape. My setter dog, which had followed me, went up to them and took one in her mouth and brought it to me alive. I then, without any difficulty, picked up the others and held them in my hands for some little time. They manifested no fear at all, and seemed perfectly contented, even showing no desire to escape when placed on the ground again. I had to put them in the burrow before they would disappear. These were the first I had ever seen which showed no fear of man or dog. From their size, not longer than four or five inches, I judged them to be about a month old.

Regarding the distribution of the gopher, I may add that I have seen the animal in Wyoming, Utah, Colorado and Montana, from the Platte to the Marias river. Very Respectfully,

S. M. SWIGERT, 1st Lieut. 2d Cavalry.

OVIPAROUS SNAKES.—In his article "On the question 'Do snakes swallow their young?'" (Proc. Am. Assoc. Adv. Sci. for 1873) Mr. Goode states that certain species of snakes, with which he includes *Heterodon platyrhinos* and *Tropidonotus sipedon*, are ovo-viviparous.

I have in my possession two eggs of *H. platyrhinos* from a set of twenty-two ploughed out of the sand at East Hampton, L. I., on the 10th of September, 1877.

The fact that these eggs had been buried and left in the sand, and that of the two in my possession one did not hatch till the fourth day after its discovery (the other being then put in alcohol to prevent its hatching) shows conclusively that this species is sometimes, at least, oviparous.

Can it be true of this species and of *T. sipedon*, which a communication from Prof. Cope states to be oviparous, that they are oviparous in some cases and ovo-viviparous in others, as is supposed are some of the *Eutæniæ*?—*F. W. Cragin*.

STRATAGEM OF A WASP.—One day when in Southern New Jersey, wearied with the heat, I was resting under a large oak, when my attention was drawn to what at first seemed a strangely variegated insect on the trunk of the tree; closer examination showed the apparently single insect to be really two insects, one a wasp the other a roach. My approach frightened the wasp off, but the roach did not move, at least very far. Wishing to understand why the wasp had been so near the roach, I quietly watched till the wasp returned. It had no sooner alighted, than going to the roach it seized it by the base of one of its antennæ and proceeded to back up the tree, dragging the roach after it. I soon perceived that the probable reason the roach did not escape when the wasp had been frightened off was, that it had been stung. It is well known that wasps frequently sting spiders and larvæ just sufficiently to paralyze them, so that they may not decay before the young, for whom they are destined, are in condition to feed upon them. But it seems in the instance above cited, as if the wasp had only so far injured the roach as to render it incapable of escape, but not incapable of walking. By which stratagem it was thus saved the labor of bodily carrying its victim to its nest. Where its nest was, and whether the roach was destined to be food for the young to be, I could not ascertain, for unwittingly I frightened the wasp off again, and it did not return while I remained by the spot.—*Henry Turner*.

BELEOSTOMA PISCIVOROUS.—In the spring of 1878, at Ithaca, N. Y., I had confined, in a jar of water with stickle-backs (*Gasterosteus*) and other fishes, a large specimen of a water-bug (*Beleostoma*). At different times I found dead fishes in the jar, and surmised, from the appearance of a wound on each of them, that the water-bug had been the cause of their death. This sup-

position was afterwards corroborated by seeing a fish vainly struggling to free itself from the *Beleostoma* that had pierced it with its beak and was, to all appearance, pumping out its blood. This particular specimen of *Beleostoma* was in great need of nourishment, for it provided for over a hundred plump little red mites that were attached to different portions of its body.—*Henry Turner*.

NORTHERN RANGE OF CERMATIA FORCEPS.—Mr. Samuel Henshaw writes us that of this Myriopod the museum of the Boston Society of Natural History contains six specimens taken in Massachusetts, and that he knows of three others found in the same State. Mr. F. G. Sanborn tells him that it has been taken in Milford, N. H. Mr. J. H. Emerton states that it has also occurred in Essex County, Mass.

THE BRAIN OF INSECTS.—An interesting paper, by E. T. Newton, on this subject appears in the *Quarterly Journal of Microscopical Science* for July. The author refers to the complicated internal structure of the brain of insects as first pointed out by Dujardin. Faive has shown that the power of coördinating the movements of the body is lodged in the infra-oesophageal ganglia; this being the case, Newton thinks that both the upper and lower pairs of ganglia ought to be regarded as forming parts of the insect's brain. Brandt, in a paper read September 1st before the French Academy, states, *inter alia*, that it is untrue that all insects have a suboesophageal ganglion separate from the others (*Rhizotrogus*, *Stylops* and *Hydrometra* have not). The circumvolutions of the brain are found in *all* insects, in various developments, and the development differs in individuals of the same species. In general, the development of the hemispheres, but not of the whole brain, is related to instincts and habits. In some insects having two thoracic ganglia, the first is simple, the second compound, in others both are compound. The transformation of the nervous system takes place in some insects by reduction of the number of ganglia, in others by an opposite process.

AGENCY OF INFUSORIA IN FERTILIZING SEA-WEEDS.—It appears from the studies of Prof. Dodel-Port, the eminent Zurich botanist, says *Nature*, that certain infusoria harbored by the red sea-weeds, return the favor by fertilizing the sea-weeds on which they live. Thus the currents formed in the water by the bell-shaped animalcules (Vorticella) situated on the shrub-like branches of a *Polysiphonia*, bear the otherwise immovable spores (antherozoids) of this Alga to the female plants, which are thus fertilized, just as pollen-collecting insects fertilize willow blossoms or other flowers; and as many insects feed on pollen, so the animalcules or infusorians feed on the spores of the sea-weeds.

MIMICRY IN A SNAKE.—In 1879, while out with the Hayden Survey, I was detained about a week, by high water, on the south

bank of the San Juan river, near the line between New Mexico and Colorado. While out one day with my guide, we came across a very large bull-snake (*Pityophis* sp.?). The reptile was suspended on some small dead oak trees about two feet from the ground. These little trees were about as thick through as the snake, and the bark was ringed and spotted much as he appeared. We went close to the snake, but he did not stir, remaining apparently stiff and rigid like the sticks upon which he lay. We viewed him for some moments, commenting upon his singular position and appearance, when "Frank" finally shot his head off. As this snake closely resembled, in size and color, the little slender oaks which abound in that region, and which are often found bent to the ground, dead, it occurred to me that he was practicing deception, either to enable him to capture a bird or other prey, or to conceal himself from his enemies.—*Chas. Aldrich, Webster city, Iowa.*

VIBRATIONS OF THE TAIL IN SNAKES.—I had occasionally seen this manifestation in some of our common, harmless snakes, in years past, but my attention was specially directed to it last year, while making collections for the National Museum and the Zoölogical Garden, Philadelphia. Among my captures were some large specimens of a species of wolf-snake (*Coluber obsoletus confinis*). Whenever these reptiles were disturbed or annoyed, they would vibrate their tails precisely like our rattlesnakes, and with a very similar sound, snapping at any movable object within reach. They had a general resemblance in color to our rattlesnakes, and if met unawares in the dry grass, one might well believe on the instant that he had encountered a genuine massasauga!—*Chas. Aldrich, Webster city, Iowa.*

THE HABITS OF THE ORANG.—In an interesting paper on the orang, read by Mr. W. F. Hornaday at the Saratoga meeting of the American Association for the Advancement of Science, he records the following facts and impressions from personal observations in Borneo:

"Each individual of the Bornean orangs differs from his fellows, and has as many facial peculiarities belonging to himself alone as can be found in the individuals of any unmixed race of human beings. According to my experience," Mr. Hornaday said, "orangs differ from each other fully as much as either Chinese or Japanese, if not more. The faces of the more intelligent orangs are capable of a great variety of expression, and in some the exhibition of the various passions which are popularly supposed to belong to human beings alone, is truly remarkable. I had in my possession, in Borneo, four young living orangs. Three were dull and intractable, but the fourth was a perpetual wonder both to Europeans and the natives themselves. For weeks it lived in the same room with me so that I watched it

almost constantly. The expression of its face was highly intelligent, while the intellectual development of its forehead and entire cranium would have been quite alarming to any enemy of the theory of evolution. This specimen was a fine healthy male infant about seven or eight months old, twenty-two and a-quarter inches in height, thirty-seven inches in extent of arms and fifteen and a-half pounds in weight. He exhibited fully as much intelligence as any child under two years of age, with all the emotions of affection, dislike, anger, fear, cunning, playfulness and even ennui. When teased beyond endurance he would first whine fitfully, but if the teasing were continued, he would throw himself upon the floor, kicking and screaming and catching his breath as loudly and naturally as a big spoiled child. He was afraid of strangers as a rule, but decidedly attached to my Chinese servant and myself. When alarmed by a large dog or other animal, he would shuffle up to me and climb with all haste into my arms. When a cat came near him he would grab it by the tail with the very same action and bright, mischievous expression of face that we have all seen in human children.

"Last year while on a collecting expedition for Prof. H. A. Ward, I had ample opportunities to study the habits of the orang outang in its native forests. I visited Borneo in August, 1878, for the sole purpose of obtaining specimens of the Bornean Simia and to study the different species. I visited the territory of Sarawak and for two and a-half months devoted my entire time to hunting the orang along the River Sadong and its tributary, the Simujan. This whole region is one vast swamp, covered everywhere with a dense growth of lofty virgin forest. During the fruit season, from the middle of January to May 1, the food of the orang is the durlon, mangosteen and rambutan. During the hot months of May, June and July they retire far into the depths of the forest, and are exceedingly difficult to find. But during the season of the heaviest rains, from August to November, when the forests are flooded, the orangs are found in the vicinity of the rivers. I soon found that the only way to reach them would be to paddle up and down the rivers and watch for them in the tree tops. Near the source of the Simujan river, and far beyond the last Dyak village, we found great numbers of old orang nests and some which were quite new. The nest consists of a quantity of leafy branches broken off and piled loosely into the fork of a tree. The orang usually selects a sapling and builds his nest in its top, even though his weight causes it to sway alarmingly. He often builds his nest within twenty-five feet of the ground and seldom higher than forty feet. Sometimes it is fully three feet in diameter, but usually not more than two, and quite flat on the top. There is no weaving together of branches. In short the orang builds a nest precisely as a man would build one for himself were he obliged to pass a night in a tree top and

had nothing to cut branches with. I have seen one or two such nests of men in the forest, where the builder had only his bare hands to work with, and they were just as rudely constructed, of just such materials, and in about the same position as the average orang nest. Upon this leafy platform the orang lies prone upon his back, with his long arms and short thick legs thrust outward and upward, firmly grasping, while he sleeps, the nearest large branches within his reach. On several occasions I surprised these animals upon their nests, and once I had an opportunity to watch an orang while it constructed its resting place. He never uses a nest after the leaves become withered and dry, no doubt because the bare branches are not comfortable to lie upon. I never saw or heard of any house-building by orang outangs.

"We found the animals most numerous along the Simujan river, near its source. Our manner of hunting was to make trips up and down the river in our boat, paddling slowly and silently along, keeping a careful lookout. Sometimes in rounding a bend in the river we would come full upon a huge, black-faced, red-haired animal reposing quietly or feeding. I aimed to shoot them through the chest, and thus either kill them at once or disable them so that they would be unable to get away. On several occasions I succeeded in killing a large specimen with a single bullet. It would at all times have been an easy matter to have shot them through the head, but this would have ruined the skulls. As soon as an orang was fired at, if not killed at once, he would begin climbing away with all haste.

"I think we may fairly consider the orangs the most helpless of all quadrumana. Owing to the great weight of their bodies and the peculiar structure of their hands they cannot run nimbly along even the largest branches, and never dare to spring from one tree to the next. The weight of the adult male ranges from 120 to 160 pounds. Owing to the disproportionate shortness of his legs, his progress depends mainly upon his long, sinewy arms, and very often he goes swinging through a tree top by their aid alone. Upon the ground orangs are a picture of the most abject helplessness, and in their native forest they are very seldom known to descend to the earth. They are utterly incapable of standing fully erect without touching the ground with their hands, and for them to be represented in drawings and museums as standing erect, is contrary to nature."

In conclusion, Mr. Hornaday remarked: "We will not say anything about the part of orangs in the long chain of evolution, for we feel that no one present will wish to admit his or her relationship. But while abstract argument leads hither and thither, according as this or that writer is most ably gifted for argument, there is still one influence to which every true naturalist is amenable, and which no one will ignore who has studied from nature any group of natural forms. Let such an one (if indeed such an one

exists to-day), who is prejudiced against Darwinian views, go to the forests of Borneo. Let him there watch from day to day this strangely human form in all its various phases of existence. Let him see it climb, walk, build its nest, eat and drink, and fight like human 'roughs.' Let him see the female suckle her young and carry it astride her hip precisely as do the Coolie women of Hindoostan. Let him witness their human-like emotions of affection, satisfaction, pain and childish rage—let him see all this and then he may feel how much more patent has been this lesson than all he has read in pages of abstract ratiocination."

ZOOLOGICAL NEWS.—In his presidential address before the British Association, Prof. Allman takes the ground that the deep-sea *Bathybius* may be an organism, as he thinks it not easy to believe that the very elaborate investigations of Huxley and Haeckel can be easily set aside. Huxley, at the close of the address, stated that his mind, at present, was in a state of suspense about it, though within a short time he had disowned it. Haeckel, himself, has, in recent papers, urged its recognition as an organism, while we may add that Dr. Bessels, in a letter to us, thinks that under the circumstances it is best to wait for more light as to the organic nature of the *Protobathybius* which he examined in the high Arctic regions.—The pamphlet of Prof. Moebius has made a strong impression on some minds previously in doubt, that *Eozoön* is of mineral rather than organic origin.—In the Proceedings of the Natural Science Association of Christiania, Norway, Prof. G. O. Sars gives excellent drawings of three whales, *Balenoptera rostrata*, *B. musculus* and *B. sibbaldii*. One can form some idea how these whales look from such admirable and evidently life-like sketches.—The Zoölogy of the Fiords near Bergen, Norway, by the Rev. A. M. Norman. (*Journal of Conchology*, II, 1879. Extracted, pp. 77.) This paper contains a list of 261 species of Mollusca collected at Bergen, Norway, by the author, and a supplemental list of ninety-two more which have been quoted from that region. No new species are described, but the notes on the synonymy of the species and their geographical distribution make the article both valuable and interesting.

ANTHROPOLOGY.¹

PREHISTORIC IMPLEMENTS OF THE RIVERS COYOTE AND GUADALOUPE, SANTA CLARA COUNTY, CAL.—Some three years ago my interest was awakened concerning prehistoric implements by finding what were, without doubt, stone and flint celts, though of rude workmanship.

Before this time there had been found in various places throughout the valley, while plowing fields and digging away river banks in bridge building, mortars in different stages of preservation.

¹ Edited by Prof. OTIS T. MASON, Columbian College, Washington, D. C.

Not much heed was paid to the occurrences, as they were accepted as the matter of fact details of a land whose commonplace things were accounted unusual and wonderful by people living in other States. A few winters ago, when the river Coyote endangered the city by an overflow, about forty acres were washed out on the west bank. About two miles below this washout were found two curious mortars or bowls, one fitting into the other. Farther search brought to light small implements plainly bearing marks of flaking tools. But as foreign countries seemed most likely to contain all the evidences of prehistoric man, on account of their greater geological age, the idea that they were the implements of any but a recent and degraded race, was set aside. Soon, however, a perfect arrow-head was found, which threw a flood of light on future research, which was prosecuted with earnestness, resulting in the discovery of many and some of them beautiful implements of flint, jasper, chalcedony, agate, &c., as well as some made from granite, gneiss, &c.

These implements consist of knives, scrapers, arrows, drills, polishers, hammers, flakers, saws, axes, war-clubs, sling-stones, sinkers, charms or amulets, &c. They were found scattered along the river-bed below the washed-out field. The supposition is, that this locality was either a favorite camping ground or place of burial.

The scarcity of tools of the better class would indicate that this was only used as a place of sojournment for stated periods of hunting and fishing, or that some noted persons were buried here with the necessary utensils for their welfare in the happy hunting grounds. The number of knives, hammers and coarser implements seems to show that the encampment was for the purpose of obtaining supplies to last through a season spent elsewhere; while the fineness of material and finish of some would indicate their being used in burial.

A few implements have been found in the Guadalupe river banks, in excavations made in widening the river. They are of ruder workmanship and material than those from the Coyote. In a gravel pit on the Lick Homestead were found knives, flint cores, flakers, some small pieces of chalcedony in symmetrical shape, probably ornaments. The appearance of the Guadalupe implements compared with those from the Coyote shows the work of a different tribe, with narrower grounds of operation and perhaps of more recent date. I have called them prehistoric because many of them are polished. They are also of the materials which ethnologists have found were used earlier than the obsidian implements of recent times.—*Jennie R. Bush.*

ANTHROPOLOGICAL NEWS.—From the *Nation* of August 21st, we learn of a new and comprehensive dictionary of the Maya language with Spanish definitions, by Judge Don Juan Pio Perez. The author was born, 1798, at Merida, a short distance from

Uxmal. A long sojourn in the interior of the peninsula enabled him to study the inland dialects. The words taken from these form an important part of the dictionary, and are quite new. The coast dialects, mostly of the northern part of Yucatan, form the groundwork of the compilation, and additions were made to it from several ancient manuscript lexicons. The illustrious author had just terminated the letter U when, in 1859, death put an end to his labors. Subsequently, in 1870, Don Carlos Peon prevailed upon Dr. C. H. Berendt to digest from the materials on hand the remaining four letters of the alphabet. The work is a good-sized quarto of 437 pages, with two prefaces, and bears the title, "Diccionario de la lengua Maya, por D. Juan Pio Perez" (Merida de Yucatan, 1866-1877). Its publication was superintended by Eligio Ancona, a friend of the deceased author, and Dr. Fabian Carillo Suaste has added a biographical notice of Perez in twenty pages. The number of vocables explained amounts to 22,000; their meanings are given in concise items, worded with great precision. Syntactic examples are not often added as illustrations of words, though terms of archæological import are provided with longer explanations. Maya possesses considerable facilities for word composition, and we often find words counting from five to seven syllables; this is partly due to the circumstance that this idiom is simultaneously a prefix and a suffix language, partly also to the frequent use of syllabic reduplication.

The International Anthropological Exhibition at Moscow, which opened there on the 15th of April last, is reported in the papers to have been a great success. It took place in an immense building which is used in winter for drilling troops. The exposition was divided into several sections, among which those of archæology, craniology and ethnography played the chief part. There was also a department in which was shown, partly by pictures and partly by objects, the different methods of rearing children, swaddling, cradling, etc. The section of craniology embraced from 1200 to 1500 crania from various provinces, among which the Russian skulls are naturally in the majority. The archæological was also especially interesting. The exposition was completed by a congress, held from the 16th to the 25th of April, in the Polytechnic Museum, the meeting place of the Society of the Friends of the Natural Sciences. A second session took place from the 8th to the 17th of August, at which delegates from the various European states were present.

The third number of the *Revue d'Anthropologie* for the current year opens with a paper of seventy pages, by Dr. Paul Broca, entitled, "Cerebral localization; Researches upon the olfactory centres." The sections of this exhaustive treatise are as follows: 1. The role of comparative anatomy in the study of cerebral localization. 2. The olfactory apparatus of the mammals. 3. The olfactory centres among anosmatics. 4. Remarks upon the

respective functions of the different olfactory centers. 5. Conclusions relative to the olfactory centers of man. Of this last-named section we give a translation in full: "It is man who forms the objective point of our study; the facts of comparative anatomy which we have just set forth would not have deserved so much discussion if they did not converge toward this point. It will not, therefore, be profitless to review, in conclusion, the notions which comparative anatomy permits us to add to the anatomy and the physiology of the brain of man.

1. The external olfactory root (*racine*) traverses the Sylvian fissure and extends to the upper part of the hippocampus. It really originates in the cortex of this lobe.

2. The internal olfactory root proceeds to the intersection of the hemisphere and loses itself in the origin of the convolution of the corpus callosum.

3. The superior olfactory root, known as the *racine grise*, derives this name from the thin layer of gray substance which is spread over its inferior face, and which is continuous with the gray layer of the perforated space, but it is made up, like the two other roots, of white fibres, which, after an extremely short passage (*trajet*), returns to the posterior edge of the two first orbital convolutions.

4. There exists in the mantle of the hemisphere three distinct olfactory centers, corresponding to the three olfactory roots.

5. The anterior olfactory center embraces the posterior portion of the two first orbital convolutions. It commences posteriorly upon the anterior edge of the perforated space, and extends, from rear to front, over the second orbital convolution to the level of the fissure in the hippocampus. Upon the first orbital convolution its anterior limit is not indicated anatomically; but it is probable that it corresponds to the same horizon. From the mean position of the fissure in hippocampus, or of the depression which represents it, we may say that the orbital olfactory center comprises, on an average, the posterior third of the two first orbital convolutions.

6. The posterior olfactory center occupies the lobe of the hippocampus, which forms about the anterior third of the convolution of the hippocampus: a transverse line carried through the extremity of the hook of the hippocampus indicates sufficiently well the limit of this olfactory center.

7. The superior olfactory center is situated upon the internal face of the hemisphere. It embraces the intersection (*carrefour*) of the hemisphere and the first portion of the lobe of the corpus callosum (or convolution of the corpus callosum) from its origin at the intersection to the level of the frontolimbic *pli de passage*, or of the frontolimbic fissure, which indicates, in front of the *genu corporis callosi*, the position of this *pli de passage* when it is profound."

It is impossible to give any conception of the vast amount of research in this valuable essay in a short review, and, therefore, our readers are referred to the paper itself.

In the same number of the *Revue* will be found a report upon the Ethnographic chart of France, by Dr. Gustav Lagneau, and a criticism of several works upon circumcision as practiced in various parts of the world, by M. Zaborowski.

GEOLOGY AND PALÆONTOLOGY.

GEOLOGICAL NOTES.—At the Saratoga meeting of the American Association for the Advancement of Science Prof. J. P. Lesley, State Geologist of Pennsylvania, read a very long paper on the progress of the Second Geological Survey of Pennsylvania. The very valuable results accomplished by this survey, both for scientific and economic purposes, were fully set forth, and the importance of completing it was dwelt upon.

Prof. R. P. Whitfield gave notice of the occurrence of rocks in Central Ohio, representing the Marcellus shales of New York. A brief dissertation on the geology of Port Henry, New York, was presented by Prof. T. Sterry Hunt, of Montreal.

Prof. John W. Chickering, Jr., gave a description of the newly discovered cave at Luray, Page county, Va., which he said surpassed the Mammoth cave in beauty and in the size of some of its chambers, and was inferior only in total extent.

Miss Emily A. Smith, of Peoria, Ill., read a paper on the great Oberstein industry, showing the methods of cutting, coloring and polishing agates and secondary gems. She illustrated her remarks by a very fine collection of specimens, which were greatly admired. In the little German village of Oberstein and its vicinity are the 189 mills which cut and polish the countless agates before they are scattered to the four corners of the earth. She visited the locality last season. Through this region is a ledge of trap rock or metaphyx, which was formerly quarried for agates. These quarries are now deserted, and all the agates worked are imported yearly, principally from Brazil, and sold at public auction, the owners of the wheels buying each the amount he can work up during the year. Many of these mills date back to the middle ages. After the secret of coloring was discovered from the Romans, it was found that the Brazilian agates were much more porous, and consequently more readily received the coloring matter. The coloring is principally done at the houses of the workmen.

Prof. F. W. Clarke displayed a specimen of graphite from the Ducktown copper mine, and read a brief paper on it. J. W. Osborn, of Washington, read notes on a peculiar case of corrosion of tin; and Prof. C. H. Hitchcock gave an account of the Blue Hill, Maine, copper veins.—Bernhard Cotta, the geological writer, whose death was announced in September, was born

in Thuringia, October 24, 1808, and became at an early age a student of natural sciences, giving especial attention to mineralogy. From 1827 to 1831 he studied at the Academy of Mining in Freiburg, where he was appointed professor in 1842. "The Dendroliths," his first work, was published in 1832. From 1832 to 1832 he was engaged with Naumann in the preparation of the "Geognostic Chart of the Kingdom of Saxony." His later works have been of much value, among them being an "Introduction to the Study of Geognosy and Geology."

GEOGRAPHY AND TRAVELS.¹

ASIA.—Col. Prejevalsky, after being detained at Zaisan on the Chinese frontier by deep snows, left there on the 21st of March last, and passing over a barren desert and along the river Urungu had reached, when last heard from, the river Buguluk in the Southern Altai mountains. The climate is characterized by frost at night and heat and storm during the day.

The expedition of the Count Széchényi had, according to recent dispatches, reached Suchau, on the frontier of Kansu, without impediment, coming by way of Si-ngan the capital of Shen-si and Lan-chow, in Kansu, over passes 9000 feet high, where the temperature fell to thirteen degrees below zero (Fahr.). Here, however, they were refused a safe conduct to the lake Lob-Nor, the Viceroy declaring his inability to protect the expedition. Count Széchényi had, therefore, to abandon his proposed journey across the Kum-Tag to the Lob-Nor. He hoped, however, to start shortly for Lhassa by way of the Koko-Nor.

M. Woëikof has sent to the French Geographical Society a memoir on the Oxus question. After having studied the problem on the spot, the Russian geographer feels certain that the suppression of the Caspian mouth was produced not by a gradual elevation of the country, but by an accumulation of deposits in the bed of the river and the immense drainage produced by the development of irrigation in the Khivan oasis. He feels certain that the restoration of the former state of things would be a very easy work. The restoration of the Caspian, he believes, would reduce the area of the Aral to one-third of its present extent, nor would the change be altogether detrimental to the prosperity of the surrounding countries. When the countries situated between the Caspian and Aral basins shall have become civilized and have utilized for agricultural purposes the waters of all the rivers which feed the interior seas, the Aral will exist no longer, and the Caspian will be reduced to two lakes of nearly elliptical form. The Volga will be joined to the Oxus by a straight canal passing by the eastern side of the Caspian, and its vessels will reach, without transshipment, the northern part of Afghanistan.

In the discussion that followed the reading of this paper, M.

¹ Edited by ELLIS H. YARNALL, Philadelphia.

D'Abaddie, speaking of the determination of altitudes by the species of plants growing at various heights, alluded to by M. Woëikoff, said that during his travels in Abyssinia, after having made known to several botanists the fact that vegetation was distributed with great regularity on the mountains, he was invited by some botanists to verify the height of a mountain that he had indicated from native information as lower than a neighboring peak. The trees which had been indicated as growing on the summits of the two mountains showed that the lower one ought to have been the higher. The two mountains were surveyed hypsometrically, and the results showed that the botanists were right and the natives wrong.

In the annual address on the progress of geography at the anniversary meeting of the Royal Geographical Society, Mr. C. R. Markham stated that "an important advance towards the solution of one of the chief Asiatic geographical problems has been made this year, namely, the discovery of another section of the unexplored course of the Brahmapootra. One of Col. Walker's indefatigable native explorer's has traced and surveyed the Sanpu, the great river of Thibet, for two hundred miles beyond Chetang, the most eastern point to which it had hitherto been followed. Here the river turned southwards into the hills and between this point and that reached by Capt. Wilcox on the Dihong, in his journey from the Assam plain, in 1825, there is a comparatively short gap. But in that interval there is a fall of 8000 feet and upwards, so that the complete discovery of the still unknown portion will probably disclose a scene of wonderful sublimity—one of the last and perhaps the grandest of nature's secrets.

LIEUT. WHEELER'S SURVEY WORK IN OREGON, 1878.—Mr. J. W. Goad, one of the survey party, sends the following account of Lieut. Wheeler's operations in Oregon during the past year, to the Royal Geographical Society :

"On the road northwards from Reno, in Nevada, along the Californian eastern boundary, Pyramid lake, which receives the Truckee river and has no visible outlet, was explored; it is forty miles long, of immense depth, and conspicuous for its white columnar rocks, and is probably the least known of the North American lakes. It appears an open question whether there is a subterranean drainage in this part of North-west Nevada, or whether the dry climate evaporates the surplus water in the valleys. Crossing the volcanic Warner range, the oasis of Surprise valley, a fertile space of fifty miles in the midst of an arid sage-bush country, was visited and its thermal springs examined. Oregon was entered near Mount Bidwell, a bluff terminating the Warner range to the north, and here the party was organized, one of its objects (approved by Gen. Humphreys) being to make a complete reconnaissance of the Cascade mountains and a sur-

vey of the area between them and the 119th meridian. After crossing the arid and volcanic Oregon desert to the alkaline lake Albert (where the party narrowly escaped Indian attack) a peculiar difference was observed between the valleys of the Chewancan and Summer lakes, the latter though only 300 feet lower, and but a few miles distant, having a considerably higher temperature. Its waters were strongly impregnated with borax, etc. The Klamath lakes were also visited and found to present the same typical features as Pyramid lake, undoubtedly belonging to the Great Basin plateau. At Klamath Lieut. Wheeler divided the party, himself exploring the Cascade range parallel to the Pacific coast, and Lieut. Symons, Mr. Goad and others carrying the triangulation to the north. Mount Pitt, 4000 feet above the country level and 10,000 feet above the sea, was scaled with great difficulty on account of lava, fallen timber and rock-slides; the latter are accumulations of débris held in position by some slight and unseen projection, and only requiring the weight of a man or removal of a stone to set them in motion.

"From another peak, Crater lake came in sight—a vast body of water confined in vertical cliffs 2000 feet in height; its area is about fifty miles and the geological evidence indicated comparatively recent volcanic action. Proceeding northwards many huge piles of rock, deep snow banks and innumerable small lakes were found, the party, on one occasion, passing through a frozen snow tunnel seventy to eighty feet thick. This work on the mountain crest was at last stopped by the dense forests and tangled undergrowth, thousands of acres of which are often set on fire by the Indians when driving the game, the entire consumption of oxygen in the woods causing the flame to rise and form a sheet miles in length and from one hundred to five hundred feet high.

"Leaving the mountains for the Deschutes valley, it was found that the turbulent river of that name, after apparently emptying itself into a lake with no outlet, percolated through piled up masses of lava on its shores, and reappeared ten miles further north. It can never be navigable on account of its numerous cascades and rapids. Mount Jefferson was visited but found impracticable from the lateness of the season. On the road from its base to Dalles, on the Columbia river, the warm springs, much visited by Indians, were examined—their waters collect in basins which are impregnated with a green mineral substance. Interesting data concerning Mount Hood (12,000 feet) were obtained from Mr. Walker, of the Warm Spring agency, who had ascended it. Far above the snow line, hot steam issues from craters on its side; five hundred feet from the top is a large basin with the main crater giving out sulphurous steam. Other craters and huge glaciers exist also on its south-east side. The White river, which rises in Mount Hood, owes its name to a sediment of pulverized pumice which is washed far down the

Columbia river in quantities sufficient to form white dunes on its shores by the action of the winds. Its falls were some 180 feet high.

"At Dalles a base line was measured and a series of triangles carried into Washington Territory. In summing up the capabilities of Oregon, which, west of the Cascades, are well known to be very great, it is observed that although to the east of that range the rain-fall is not great, the land is very fertile in the Deschutes basin, and the supply of water for irrigation abundant."

ARCTIC EXPLORATION.—In 1880 Lieut. Weyprecht of the last Austro-Hungarian Polar Expedition, intends starting for Novaya Zemlya, to remain at least one year, to take meteorological, hydrographical and other observations. The expenses are to be defrayed by Count Wilczek, who may himself accompany the lieutenant.

On June 3, 1879, the Dutch North Polar Expedition again sailed from Amsterdam on board the schooner *Willem Barentz*. They will first visit Barentz's Ice-haven and erect a suitable monument to his memory. A voyage into the Kara sea will be attempted. Meteorological, zoölogical and other observations and deep-sea soundings will be made as on her previous voyage last season.

Capt. A. H. Markham left England early in May last for Tromsø, whence he sailed in the little yacht *Isbjörn* to undertake an examination of the ice between Spitzbergen and Novaya Zemlya, and ascertain the practicability of reaching the west side of Franz Josef Land and advancing further north along its coast.

The steamer *Jeannette* sailed from San Francisco on July 8th for Behring strait. This vessel was formerly H. M. S. *Pandora*, and under Capt. Allen Young made two voyages to the Arctic regions. She is 420 tons burden, and has been most liberally equipped and supplied for her present voyage by her owner, Mr. James Gordon Bennett, at an expense of \$300,000. By an act of Congress she has been enrolled as a vessel of the U. S. Navy, and the officers and crew are subject, therefore, to naval discipline. They are thirty-two in number. Lieut. George W. De Long is in command; he was, in 1873, the navigator of the *Funiata* that, with the *Tigress*, went in search of the *Polaris*. Among the officers are a meteorologist and a naturalist. The crew are picked men, and several of them have had experience in Arctic navigation. The *Jeannette* arrived at Ounalashka in the Aleutian islands on August 2d. After coaling there, she would proceed to St. Michael's, Alaska, where dogs and sledges were to be shipped.

The Franklin Search party landed from the ship *Eothen* on the north shore of Hudsons bay, near Depot island, on August 9, 1878. During the following months careful surveys were made of the adjacent coast from Cape Fullerton to Marble island, and journeys taken into the interior. On April 1, 1879, the party

with four additional Esquimaux and their families, making in all sixteen souls with four sledges and about sixty dogs, started for King William Land.

GEOGRAPHICAL NEWS.—The long sojourn of the Russian troops in Bulgaria and Roumelia has been fruitful of results to geographical knowledge. A series of astronomical and geodetic observations have fairly completed a network of triangulation and maps, based on the data thus obtained, which will soon appear.—The council of the Royal Geographical Society have determined to provide instruction in surveying and mapping, including the fixing of positions by astronomical observations, for those of their countrymen about to visit the less known portions of the globe.—Commander V. L. Cameron, the well known African explorer, the *Academy* states, has made an interesting journey through Syria and along the Tigris to Bagdad, in order to ascertain the practicability of a railroad from the Mediterranean to the Persian gulf. He found that there were no physical difficulties in the way, and that the local traffic alone would prove remunerative.—The committee of the Palestine Exploration Fund (English) will issue a subscriptional large paper edition of their survey of Western Palestine. The number of copies will be limited to 250. The work will comprise six or more quarto volumes and the great map in twenty-six sheets. The price will be twelve guineas. No cheaper edition is to be published. The American Survey map of Eastern Palestine is to appear in the same form a little later.—H. M. S. *Alert*, Sir George Nares commander, on her voyage to Magellan straits, in the autumn of 1878, took soundings over the Hotspur and Victoria banks. These singular isolated shoal banks, lying between the parallels of 18° and 21° S., and distant fifty to sixty leagues from the South American continent, average in their depths from twenty-five to thirty and thirty-five fathoms, and so far as explored are composed of dead coral worn down to a level surface and smoothed with a very thin incrustation of fine *Polyzoa*. The observations of Sir George Nares lead him to infer that these banks were once reefs of living coral with shallow water over them which have subsided to their present depth, but that the subsidence was too rapid for the reef-building coral animals to keep pace therewith, and the banks are now at too great a depth for the coral to exist.

MICROSCOPY.¹

THE POSTAL MICROSCOPICAL CLUB.—This club, whose work was suspended last winter on account of postal difficulties, has resumed its operations again. It was presumed by many that the effect of the new postal law which went into effect last spring would be to permit the mailing of slides as heretofore. It was found, however, that the single wooden boxes which had always been

¹ This department is edited by Dr. R. H. WARD, Troy, N. Y.

used were not at present satisfactory to the Post-office Department. For the purpose of absolute safety a double security was required, and the wooden box must be itself enclosed in a metal case. A feasible method of accomplishing this has now been introduced by the club by wrapping around the box a sheet of thin brass, left open at the ends and held in place by the twine with which the box is tied up. This method is approved by the department, and is only a trifling addition to the weight or expensiveness of the box; and the brass cover can be used without renewal for an indefinite length of time. The following officers have been elected: President, Rev. Samuel Lockwood, of Freehold, N. J.; secretary, Rev. A. B. Hervey, of Taunton, Mass.; assistant secretary and treasurer, Joseph McKay, 24 Liberty street, Troy, N. Y.; managers, R. H. Ward, M.D., Troy, N. Y., and C. M. Vorce, Cleveland, O.

A NEW LOCAL CLUB.—Early in August the "Griffith Club of Microscopy" was organized at Detroit, Prof. Samuel A. Jones being chairman of the meeting. The new club was well represented at the Buffalo meeting of the American Society of Microscopists. It is proposed to hold weekly meetings for study and work, beginning October 1st, at a private office.

WEST CHESTER PHILOSOPHICAL SOCIETY.—This society is taking a place among the most active and successful microscopical societies. At the September meeting an excellent note on the fertilization of plants, with special relation to the question of insect fertilization, was read by Dr. J. R. McClurg, chairman of the Microscopical Section. In opposition to the theory of Darwin, Lubbock and others, that the sweets (and colors?) of flowers exist expressly for insects, in order to attract their visits and thus secure cross-fertilization, he states with much prominence, if not formal approval, the theory of Rev. Geo. Henslow, that the sweets existed before insects used them, though they have been subsequently increased by such use; that self-fertilization and not cross-fertilization is natural to the plants, and that self-sterility has resulted from habitual insect fertilization, and is therefore a dire necessity and not an original and beneficial trait. Mr. Wm. T. Haines also delivered an able address on cryptogamic botany, in which the beauties of the Pezizas and the ethics of scientific intercourse were dwelt upon with equal vigor and effect.

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SCIENTIFIC NEWS.

— Some interesting suggestions as to the evolution of the Vertebrata appear in Prof. Parker's Hunterian Lectures, recently reported in *Nature*. He recognizes "how thoroughly intermediate between the true reptiles and birds, the extinct birds of the chalk and the oölite were." As regards the mammals he says:

"Such a hypothesis as that nature had either all her birds or all her mammals from one stock is at once upset by the facts presented by the structure of the lowest mammals, the duck-billed Platypus and the Echidna. Between the mammals and the types which foreshadow them, viz: the Selachians and the Batrachians, there is unfortunately a large chasm, and, moreover, the Platypus and Echidna refuse to lie fairly in the direction indicated at the top of this chasm, or they confusingly partake of the characters of the reptile and bird; as well as those which are peculiarly mammalian * * * as already mentioned, the forecast of the mammalian type, which is very plain in the cartilaginous fishes, becomes much more plain, definite and indubitable in the frog and toad. In fact, the building materials are passed from hand to hand, as it were, in this way: the batrachian forefathers brought down all things meet for the work, borrowing and taking cartilages from the Selachians and bones from the Ganoids, and noiselessly forming them, after due selection, into a new, more compounded and noble structure. The rude ancestors of the tribes that give suck began to build on this higher level 'until the consummation was effected of vertebrate form.' But the consummation of all, the election and selection that has been going on since the beginning of the ages, is seen in man, who alone gives meaning to, and reads the meaning of, the whole mystery of organic life."

— From his recent studies on the habits of the cotton-worm moth, Prof. C. V. Riley concludes, in a paper lately read before the National Academy of Sciences, that the species is not represented by the egg, larva or chrysalis in the winter, but that the moth hibernates. His paper ends as follows: "My own belief now is that the moth really survives the winter in the more southern portions of the cotton belt, as on the Sea islands of Georgia and in parts of Florida and Texas, and that it is from this more southern portion that it spreads this year.

"This belief, which yet lacks full confirmation, does not preclude the occasional coming of the moth from foreign, more tropical countries, or the possibility of its being brought by favorable winds from such exterior regions; though the fact is established that it could not have come from the Bahamas since 1866.

"The question has an important practical bearing, for, on the theory of the insect's ability to remain with us, much important fall and winter work of a preventive nature may be done in destroying the moths; whereas on the theory of its annual perishing and necessarily coming from foreign countries, no such preventive measures are left to the planter. The time employed in baiting and destroying the last brood of moths in autumn will be wasted, and he must helplessly await the coming of the parent the ensuing spring, and deal as best he can with the progeny."

— The papers read before the British Association at its last meeting, so far as reports in *Nature* and elsewhere show, comprised nothing especially noteworthy. The address of Prof. St. George Mivart before the Biological Section was on Buffon; that of Prof. Lankester was on Degeneration, an extension of some speculations made by Dr. Dohrn, while in anthropology the address of Mr. Tylor was interesting and useful. The meeting of the French Association was not characterized by any papers of a high degree of interest. The sixty-second meeting of Swiss Naturalists at St. Gall, was well attended, and Prof. Vogt, in a brilliant lecture, exhibited very good photographs of the second more perfect specimen of *Archaeopteryx* found at Solenhofen, which, according to the report in *Nature*, "proves undoubtedly that we have to do with a bird-like reptile of the size of a pigeon, which had both scales and feathers, a beak provided with teeth, armed wings, bird-like feet with nails and a reptile tail consisting of twenty vertebrae." On the whole the Saratoga meeting of the American Association was characterized by apparently quite as able papers as those read at Sheffield, or Montpellier, or St. Gall. The British and French Associations made large grants for scientific research, an example which might be followed to better advantage to science by our association, than by printing a volume of transactions for gratuitous distribution, and maintaining a library, and paying office rent, and clerical assistance.

— Prof. Archibald Geikie is now delivering, in Boston, a course of Lowell lectures on earth-sculpture. He is well known in this country as the leading geologist of Scotland. He was appointed on the Geological Survey of Great Britain in 1855, and director of the Geological Survey of Scotland in 1867, and in December, 1870, to the new chair of mineralogy and geology in the University of Edinburgh, established by Sir Roderick Murchison and the Crown. He has written many important memoirs on geology and kindred subjects. He published the *Story of a Boulder* in 1858, and the *Life of Edward Forbes* in 1861; the *Phenomena of Glacial Drift in Scotland* in 1863; *Scenery of Scotland, &c.*, in 1865; *Memoirs of Sir Roderick Murchison*, in two volumes, in 1874, with several elementary text books on geology and physical geography; articles in *Quarterly Journal of Geological Society of London* and other societies; in the *Quarterly and North British Reviews*. He has recently received a gold medal from the Royal Society of Edinburgh, for his memoirs on the Old Red Sandstone of Western Europe. He arrived in New York and started for the West August 12th, visiting the Yellowstone Park, Salt Lake, Wasatch and Uinta mountains, to study the glacial phenomena of those regions, returning East, Oct. 1st.

— The U. S. Geological and Topographical Survey, under the direction of Clarence King, has been fully organized, and has been

in the field of its proposed operations. It was the intention of Mr. King to devote the summer mainly to practical economic work, making as thorough an examination as possible of western mineral lands, and determining as far as practicable the nature, origin, geology, location and distribution of the various classes of ores. Mr. King's personal attention has been given mainly to the celebrated Comstock lode, in Nevada, and the central gold fields of California. He is assisted by Arnold Hague, late imperial minister expert for China, Mr. J. K. Gilbert, and Prof. F. V. Hayden. The specialists of the expedition in mining geology are Prof. Raphael Pumpelly, late of Harvard College, Prof. George F. Becker, professor of mining geology in the University of California, and Arthur Foot. The fields especially worked are, first, the metallic region of Colorado, centering at Leadville, in charge of S. F. Emmons, geologist, with A. D. Wilson as topographer; second, the lead-silver region centering at Eureka, Nevada, in charge of Prof. Becker, with F. A. Clark as topographer, and third, the Comstock lode and central gold fields of California, in charge of Mr. King, with the assistants previously mentioned.

— Dr. John B. Trask, at one time State Geologist of California, and who afterwards held a similar position in the State of Nevada, died in San Francisco on the 3d of July, at the age of 55. Dr. Trask was one of the founders of the California Academy of Sciences, and contributed many papers to the earlier volumes of its publications. Of late years he has followed his profession as a skillful medical practitioner, and will be remembered as a sympathetic and kind hearted man as well as a public spirited and useful citizen.

— The Visitors' Catalogue of the Museum of the Peabody Academy of Science, at Salem, Mass., is noteworthy not only from its neat appearance, but from its educational features, as the references to the specimens in the cases is preceded by a brief popular account of the different classes of animals, and with a sufficiently full list of articles and books contained in the libraries of Salem, referring to the animals, especially of Essex county. It is also provided with an index.

— The Seventh Annual Report of the Zoölogical Society of Philadelphia indicates the prosperity of this very successful project. The total excess of visitors over the attendance of last year was 76,966. On the 4th of July, 1878, 6,389 visitors were admitted. The floating debt of the society was reduced to from \$20,500 to \$9,000. There were at the time the report was made 826 vertebrates in the collection.

— A popular résumé of Prof. Mæbius' late work on Eozoön, a memoir in quarto with eighteen colored plates in the *Palæontographica*, has been published in *Die Natur* for 1879, Nos. 7, 8, 10, under the title of, Is Eozoön a fossil Rhizopod? It is illustrated

by twenty-one woodcuts, and is an interesting and, to some minds, will be a conclusive argument against the idea that Eozoön is of organic nature.

— The second part of Whiteave's volume on the Mesozoic fossils of the Geological Survey of Canada has lately been issued. It is devoted to a description of the fossils of the Cretaceous rocks of Vancouver and adjacent islands in the straits of Georgia, British Columbia. It is illustrated by excellent figures on ten plates.

— The Congrès international des Américanistes opened at Brussels September 23d. The object of the congress is to contribute to the progress of ethnological, linguistic and historical studies relative to the two Americas, especially before the time of Christopher Columbus.

— The Royal Society has issued a thick extra volume of the Philosophical Transactions (Vol. 168) containing a full account of the collections, botanical and zoölogical, made during the Transit of Venus Expedition of 1874-5, in Kerguelen island and Rodriguez.

— The tenth annual Report of the American Museum of Natural History shows progress in the increase of its collection, and especially in the deposits made of large and useful scientific libraries, which will tend to make the museum useful in advancing science.

— The Swedish Government intends to purchase the house and estate of Hammarby, near Upsala, which was the residence of Linnaeus during the latter part of his life, and has appropriated for the purpose the sum of 80,000 crowns.

— There has been established at Messina a laboratory of maritime zoölogy similar to those already formed at Naples and Trieste, on the Mediterranean, and at Concarneau, Roscoff and Wimereux, on the Atlantic.

— A recent paper states that smoke has lately been seen to issue from Mount Hood, Oregon. Is this statement correct; if so, will some of our Pacific coast subscribers send us information in regard to the matter?

— The director of the Central Park Menagerie, of New York city, reports 486 additions to the collection during 1878, the total number of animals exhibited being 1,060.

— The eminent coleopterist, Dr. J. L. Le Conte, of Philadelphia, has been elected an honorary member of the Société Entomologique de France.

— The Sponges of the Gulf of Mexico have been elaborated by Oscar Schmidt in a work published in Jena.

ERRATUM.—In my notice of Prof. Smith's Stalk-eyed Crustacea of the Atlantic coast, p. 514 line forty, of the August number of this journal, for *Carcinus* read *Calcinus*.—J. S. K.

PROCEEDINGS OF SCIENTIFIC SOCIETIES.

APPALACHIAN MOUNTAIN CLUB, August 27.—A field meeting was held at Rev. Mr. Worcester's study, near the Intervale station, North Conway, August 27, when the following papers were read: Three days' walk upon the Great Range, by W. H. Pickering; The changes in the Saco meadow caused by freshets, by Rev. Henry A. Parker; Notes upon local names of the mountains, by Rev. John Worcester; Report upon some new paths, by Dr. W. B. Parker.

BOSTON SOCIETY OF NATURAL HISTORY, October 1.—Mr. M. E. Wadsworth remarked on Danalite, Picrolite and Picrosmine.

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SELECTED ARTICLES IN SCIENTIFIC SERIALS.

QUARTERLY JOURNAL OF MICROSCOPICAL SCIENCE.—July. The morphology of the vertebrate olfactory organ, by A. Milnes Marshall. On the brain of the cockroach (*Blatta orientalis*), by E. T. Newton. The microphytes which have been found in the blood, and their relations to disease, by T. R. Lewis. On the early development of the Lacertilia, etc., by F. M. Balfour. On certain points in the anatomy of *Peripatus capensis*, by F. M. Balfour (shows that the nervous cords are minutely ganglionated).

THE GEOLOGICAL MAGAZINE.—July. How the appearance of a fault may be produced without fracture, by W. O. Crosby. The slow secular rise or fall of continental masses, by K. Petterson.

August.—A cruise among the volcanoes of the Kurile islands, by John Milne. The surface geology of a part of the Mississippi valley (Iowa), by W. J. McGee.

THE CANADIAN NATURALIST.—July 30. Sketches of the past and present condition of the Indians of Canada, by G. M. Dawson. Some observations on the *Menobranchus maculatus*, by H. Montgomery. Address on disputed points in Canadian geology, by J. W. Dawson.

JENAISCHE ZEITSCHRIFT FÜR NATURWISSENSCHAFT.—July 16. W. Haacke on blastology of corals (bears on the general morphology, the radial and bilateral symmetry of corals).

AMERICAN JOURNAL OF ARTS AND SCIENCES.—August. Terminal moraines of the North American ice-sheets, by W. Upham. The loess of the Mississippi valley and the Æolian hypothesis, by E. W. Hilgard. Discovery of a new group of Carboniferous rocks in South-eastern Ohio, by E. B. Andrews.

